The Builder.

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ILLUSTRATIONS.

New (R.C.) Presbytery, Ormskirk.—Messrs. Pugin, Architects 324
New Wesleyan Sunday Schools, Tottenham.—Mr. Charles Bell, Architect 326
The "Hôtel de Ville," Paris: as Restored.—Messrs. Ballu & Deperthes, Architects 328, 329
Welsh Calvinistic Chapel, Pendleton, Manchester.—Mr. William Dawes, Architect 331
Plan for Re-arrangement of Exeter Hall, Strand.—Mr. Alfred R. Pite, Architect 332

CONTENTS.

The Kandahar Railway 313
Bridges and Roofs 314
The Late Mr. J. H. Hakewill, Architect 315
The New Municipal Buildings for Glasgow 315
Glasgow Municipal Buildings Competition 315
The Protection of Wood and Iron by Paraffine 317
From Brussels 318
American Progress 319
Work and Wages in Ancient Glasgow 319
Temperature of Water and the General Health 320
The Antiquities of the Fyrenees 321
Sir Josiah Mason's Science College at Birmingham 321
Protection of Buildings from Lightning 322
New Wesleyan Schools, Tottenham 323
New (R.C.) Presbytery, Ormskirk 324
Re-Arrangement of Exeter Hall 325
Welsh Calvinistic Chapel and Schools, Pendleton, Manchester 327
Artisans' Dwellings in Liverpool 328
The Hôtel de Ville, Paris 329
The Working Gilders of London 335
Swansea Waterworks Reservoir 336
Industrial Exhibition at the Alexandra Palace 336
A National Coffee Publichouse in Fleet-street 337
One Hundred and Sixty New Houses in the Auction Mart: The Upton Park Estate 337
Harvesting Machines 337
Wheeling through Life 337
The Architectural Fitness of Pictures in Italian Buildings 337
Master and Scholar 338
Light and Air 338
Model Estimating 338
Graining and Marbling 338
To Every One his Own 338
Good News: The Bristol Venturers 338
Notes from Edinburgh 339
New Warehouses in Sunderland 339
Gilchrist Engineering Scholarships, University College 339
Westminster Office Competition 339
Parliamentary Jottings 339
Art Exhibitions 339
Church Building News 340
School Building News 340
School Board Schools 340
Variorum 341
Miscellanea 341

The Kandahar Railway.

IF man has been justly defined by one of the greatest of English writers as the "minister and interpreter of nature," it is none the less true that he is on his way to become the conqueror of difficulties, and the master of nature, both organic and inorganic. Thus every tale of daring and perseverance, of struggle with the elements, of victory over time and distance, has not only the charm of a romance, but the value of a fresh title-deed of the dominion of man. Another story of successful conflict,—this time with the heat of climate, and the barren inhospitality of the desert, has been that of the completion of the first section of the Kandahar railway, extending from the river Indus for 135½ miles towards the mouth of the Bolan Pass, in four months from the time of the receipt of telegraphic order from the supreme Government of India to commence the undertaking.

In the autumn of 1876, as Colonel Sir Andrew Clarke, R.E., has recently told the Institution of Civil Engineers, that officer suggested to the Government of India the importance of taking measures for keeping open, at all times and seasons, at least one available route from British India into Afghanistan. It was not, however, until September, 1879, that authority was given for the execution of a railway from Ruk, on the Sind, Punjaub, and Delhi Railway, to Quetta, in Beloochistan.

The original project of the Indian Government was for one party to make this line as far as Dadur, at the foot of the Bolan Pass, under the direction of the Engineer-in-Chief of the Indus Valley Railway, while a second party should at the same time survey the pass, with a view to the laying of a temporary narrow-gauge railway, or tramway, on the military road from Dadur to Quetta. It was found advisable for this second party to set out the line across the desert from Jacobabad to Dadur, so as to relieve the railway staff from all anxiety except as to the actual construction. It was finally arranged that the survey party, under Colonel James G. Lindsay, R.E., should not only set out the line, but should erect huts for the expected platelayers, and do all the work that was possible in advance of the platelaying party.

Thus two distinct parties were simultaneously at work, each of which attacked the problem of housing, feeding, and watering the workers in the desert from a separate point of view. The platelayers, relying on Sukkur, Shikarpur, and Jacobabad as bases, supplied everything by railway, carrying on their materials over the line as they laid it. The surveyors proposed to rely on the natural resources of the country traversed, and to bring in supplies, partly from Jacobabad, but mainly from the scattered villages and wells along the courses of the Narri and Lehri rivers, by carts, camels, and manual labour. The resources of the country, however, proved inadequate to the demand thus made upon them, and the platelaying staff was left to carry out the greater portion of the work.

Great assistance, however, was rendered to the undertaking by the construction, by the survey party, of a reservoir of the capacity of two millions of gallons, at the forty-fourth mile, being the point farthest from the Indus at which the existing channels from the Begarri and its effluent canals could deliver water. This reservoir was filled soon after the rails were laid up to it, and was frequently refilled.

The first project for housing the labourers consisted of a train of twenty covered goods wagons, to each side of which a stout sail-cloth awning 30 ft. wide was attached, which, when stretched and lashed to rails laid temporarily on either side, formed a continuous tent 400 ft. long and 70 ft. wide, the wagons serving as the ridge. The men do not seem to have taken kindly to this common shelter, and temporary huts of reed mats were constructed, and rebuilt at every three miles of the advance of the head of the work. About 100 men were constantly employed in the erection of these flying cities, and a wagon-load of fresh mats and bamboos accompanied every train. The mats were about 4 ft. 6 in. square. A single row of mats on edge formed the back wall of the shed, and another row laid flat formed the roof. The sheds were built with their backs to the north, and gave enough shelter to allow the men to sleep under them when provided with blankets. The nights are cold enough to produce ice, while the days are as hot as in an English summer. But as, contrary to expectation, no rain fell during the progress of the works, the mat-huts turned out to be a success.

The wagons before mentioned formed a travelling shop, store, hospital, and treasury. They stood at the head of the line, and were pushed forward on the arrival of each train. They also contained a reserve supply of water, for any case of emergency, under lock and key. This was chiefly kept in 400-gallon ships' tanks.

Two trains a day appear to have been run, each carrying materials for from 1 to 1½ mile of way. The afternoon train brought out 100 tons of water; the morning train brought out the miscellaneous stores, such as 3½ tons of daily food, 5 tons of daily fuel, 5 or 6 tons of building materials for sheds, and occasionally 20 tons of forage for the cattle. The officers lived in tents, and moved camp every six miles.

In the first 45 miles no difficulties were experienced in hutting the men, or in supplying food and water. But the labour of cutting the jungle, and preparing the seat of the line over the rough ground, was considerable. For the remaining 88½ miles, the line crossed the desert, and, with few exceptions, no physical difficulties were encountered. The arrangements for supply answered perfectly. The water train never once failed. The health of the men was perfect, and the weather delightful. The first 38 miles of the line were constructed in 32 days. Then a general strike of the labourers took place; but on the 12th of November most of the men returned to their work, the ringleaders having been carefully removed, and the arrangements made for crossing the desert having been fully explained to the remainder of the men. By the 5th of December they seem to have got into the full spirit of the undertaking. During that month, 49¾ miles were laid, though two days were lost. On the 1st of January (of the present year), 2¼ miles were laid for the first time,—a length that was repeated on six different days; while in one day 2¾ miles were laid. The total time occupied in the work was 101 days; of which 17 were lost, leaving 84 days for the completion of 133½ miles of railway, and, including sidings and stations, of 165 miles of single track. The actual cost of this labour amounted to 515*l.* per mile, which was thus made up:—

	Per Mile.
(1.) General charges, for collecting labour, hutting and clothing men, water and fuel	£91
(2.) Store charges for unloading, sorting, straightening and reloading materials	60
(3.) Carriage of materials and stores, and maintenance of way and rolling stock	113
(4.) Carriage of material by carts	76
(5.) Platelaying	171

The work was commenced at Ruk with 600 men, and the number was increased as fresh hands could be obtained. A mixed system of day-labour and piece-work was adopted, every man receiving a fixed daily allowance, and a fixed addition to the same for every half mile of way laid in the day over the first mile. The system was highly popular with the men, and tended greatly to ensure the rapid progress of the work.

On the arrival of each train, the materials for the way were taken from the wagons, and loaded into carts, from which they were laid out along the line ready for the platelayers to use. The laying gangs picked up the material and laid it in line. They were followed by keymen, gaugers, borers, spikers, straighteners, and lifters. A third party packed and finally straightened the line. When the work was in full swing five thousand men were engaged, of whom 1,600 were platelayers.

The main difference between this series of operations and those which were carried out through the *Grandes Landes*, in 1855, by Mr. Conder, C.E., for the *Chemin de Fer du Midi* (see Proceedings of the Institution of Civil Engineers, vol. xvi.), seems to consist in the use of carts for the forwarding of the materials from the front of the completed line over the way a-head. Six hundred carts were employed, and this part of the work appears

to have cost altogether, as we have shown, nearly 138*l.* per mile. It is probable that extra speed was thus gained, but at the risk of depending on hired cattle, and to some extent on the Sindee carters. On the *Landes* the rails were sent to the head of the work, and laid at once, wagon-load by wagon-load, provisionally, as a road over which each succeeding wagon-load of materials was carried. Economy and regularity were thus secured. The rate of progress in the *Landes* only attained a mean speed of 2·06 kilomètres, or 1·26 miles per diem (which was all that was required), while that on the Kandahar line was nearly 1·6 mile per day. But the 5,000 Indian workmen were about ten times as many as the Englishmen and Frenchmen employed on the *Landes*, and some dozen horses only were at work there, instead of the 2,000 beasts which were required in India. Occasions may occur when everything must be sacrificed to speed. But when a progress of a mile or a mile and a quarter a day is enough to meet the requirements of the case, it is worth the serious attention of the engineer to endeavour to dispense with cartage, especially with hired cartage, and to make the rails themselves answer as a temporary, as well as a permanent, road for the feeding of the platelayers with materials.

The details, for which we cannot find space, will be accessible to those of our readers whom they may interest in the forthcoming quarterly volume of the Proceedings of the Institution of Civil Engineers, in the form of communications from Colonel Sir Andrew Clarke, R.E., Mr. James Richard Bell, C.E., and Mr. George Moyle, C.E.

BRIDGES AND ROOFS.

WITH the introduction of the railway system it became necessary to cover much larger spaces than had before been required, at the same time that the constant demand made on metallurgic industry was transposing the manufacture of iron. The earliest railway roof in the south of England, that of the station of the London and Birmingham Railway at Euston, was one of unpretending simplicity. That built by Mr. Brunel, at Paddington, remains one of the most architecturally-proportioned and graceful of our large roofs. But the desire for large unbroken spans led to further innovations, of which the science is more unquestionable than the taste. An unbroken span of 166 ft. has been provided at Charing-cross Station; one of 190 ft. at Cannon-street; and one of the enormous width of 240 ft. at St. Pancras. The height of the centre line of the soffit of this last roof, above the level of the rails, is 96 ft. We may add that the cost per square (of 100 ft.) of the three last-named roofs, exclusive of gables, was respectively 34*l.*, 43*l.* 10*s.*, and 31*l.* 11*s.* There is, then, no reason to suppose that we have reached the structural limit of roof spans, nor, as the above prices indicate, the financial or economical limit. On the other hand, it may be held that the limit of architectural beauty has been wholly disregarded,—and that a very serious question may some day arise as to the prudence of erecting roofs of this magnitude, if they are not in some extraordinary way secured against the fury of an unusual, but not unprecedented, storm. If a violent wind once got under one of these roofs we should not like to answer for the consequences.

A general view of the whole subject of the arch, vault, or roof, laying down the first principles of structure; showing how these principles apply to the various materials, as affording resistance to crushing weight or to tensile strain, and citing the most famous and instructive examples of the mode in which the different cases of the problem have been solved by the great builders of the past, or of the present day, has yet to be written. It would be a work of singular value if ably executed. Our present task is less ambitious. While not closing our eyes to the certain results which science has already attained, we rather wish to take a practical view of some of the most successful examples of dealing with the problem of covering large spaces, which are,—or ought to be,—familiar to the English student. And though such a study cannot fail to result in the indication of rough general rules, we do not propose, at all events at present, to offer to our readers anything of the exhaustive and precise character of a treatise on the arch or the truss. Naturally we have to inquire into the best examples of the single arch,—as bridge, or vault, or arcade,—before we discuss the dome or roof.

Architects and engineers meet on common ground when it is a question of the design of a noble bridge. Architecturally considered, it is the elevation of the structure which first attracts the attention. When the case is one of the erection of a national monument, or the adornment of a capital, it is not easy to insist too strongly on those graceful proportions, well-defined shadows, and appropriate treatment of fit structural material, which must ever be the features that first catch, and last charm, the eye.

But when it is a question of sinking the bases of the monumental structures beneath rapid currents or stormy tides, of dealing with the treacherous basis of mud or of quicksand, of providing against the erosion of the bed of the river beneath the footings of the piers, the duty is usually handed over to the engineer. We do not wish now to raise any question as to which branch of the great structural profession is most deeply concerned in the matter. But we ask a moment's attention while we pursue the inquiry which must have suggested itself to many of our readers. How far are we in possession of materials for drawing up an approximate rule as to the determination of the best spans to be used in any given case, such, for instance, as that of carrying a road or railway over a wide river valley?

A bridge is essentially a contrivance for utilising the same topographical area at two different levels, or in two different stages. Whether it be to convey traffic over water, water over traffic, water over water, or traffic over traffic, and whether we call the contrivance a bridge, an aqueduct, a tunnel, or a viaduct, the principle is the same. The most familiar and most simple example of the principle of the bridge is that afforded by the permanent way of a railway. Each line of rail is, in point of fact, a continuous bridge; of which the piers are represented by the chairs, and the arches by the rails; the object of the structure being the support of the rolling-wheels of the vehicles at a determined level.

The illustration is obvious; but it is introduced for the reason that it will enable us at once to grasp the law which regulates the strength of piers. Leaving aside for the moment the functions of the abutment, whether as a retaining wall (with which it is often combined), or as a point of resistance to the lateral thrust of an arch, the piers of a bridge have to do the duty which would have come upon the ground covered by the structure, supposing a weight to have been brought upon it equal to that which the bridge supports. Thus, if there be an arch or a girder of 100 ft. long, supported on two piers, the weight that will come on these piers will be that which would have come upon the 100 ft. of road way, plus the weight of the arch or platform itself, and the first element of proportion in calculation comes in here. If we were to omit all practical considerations, such as the fact that it may be cheaper to build one pier of 10 ft. square than two piers of 10 ft. by 5 ft., and to suppose that weight and resistance are exactly balanced, so that there is no structural waste, it would be a matter of indifference as to cost how many piers were used within a given distance. The weight of the 100 ft. of roadway demands a certain area of support, whatever that be, divided between two or more points of support.

But we have to remember that, as far as regards the weight of the structure itself, that will be, for a certain portion of it, proportionate, not to the length covered, but to the square of the spans into which it is divided. In cases of very wide spans, we shall afterwards have occasion to test the application of this rule; but we now rather look for practical examples of the difference of cost incurred by doubling the span.

The simplest method of estimating the cubic quantity of masonry that would be necessary for crossing a given valley would be to suppose the erection of a brick or stone wall across the whole interval to be spanned, under each line of rail. Since as much as 18 tons pressure is known to come on a pair of driving-wheels in some of the locomotives now in use, and since the width of a railway sleeper may be as low as 9 in., a wall of 1 ft. 6 in. thick would be subject to a moving pressure of almost exactly eight tons on the square foot. If we take 2 ft. as the thickness of the wall, we obtain a pressure of 6 tons on the square foot. The rule proposed by the Board of Trade for the breaking weight of a cast-iron bridge is not less than three times the permanent load due to the weight of the superstructure, added to six times the greatest moving load that can be brought upon it. Ordinary brickwork is tabulated to crush at ·232 tons per square inch, or 33·4 tons per square foot; so that a weight of eight tons per square foot allows a fair margin, according to the usual rules for the strength of materials.

To this allowance has to be added that of the weight of the wall itself, which may be taken as about one hundredweight per cubic foot. If we allow 6 tons per square foot as the normal pressure, this pressure would be doubled at the base of a wall of 120 ft. high, so that one-sixtieth part should be added to the strength of the wall for each foot in height, in order to maintain an equal pressure. If a higher resisting power be allowed for, the proportion of addition for height will be calculated in the same manner.

On these bases, the mean width of the supposed walls for crossing a valley of 120 ft. in depth would be, for a double track of rails, $8+\frac{8}{2}=12$ ft., and the cubic contents per foot run would be 1,440 cubic feet, or 72 tons.

In the case, however, of a bridge where the resistance is not continuous, but concentrated on piers, the weight to be dealt with is not the maximum which can come in a moment on a certain point, as on a chair or a sleeper, but the aggregate of that which can come on the platform supported between two piers of the bridge. The heaviest weight that can thus come is that of the locomotive; and if we allow for this at 60 tons per 30 ft. run, or 2 tons per foot of bridge, we shall be within the mark, for a single line of track; taking, of course, the double for a double track. This gives so small a pressure compared to the other, that we should have to regard the resistance of materials to buckling or twisting, rather than that to crushing power, were it all for which we had to provide; and the pressure of a pier of 120 ft. high on its own base would be more than that of the load the bridge had to sustain. Without any allowance for the weight of the platform, the wall requisite to support the distributed load of four tons per foot run would be one-ninth of the former allowance, or six tons per foot run.

We have, however, to take into account the weight of the platform, or arch, itself. We may take as an example the Lockwood Viaduct, built by Mr. Hawkshaw on the Huddersfield and Sheffield Railway, which consists of thirty-two arches of 30 ft. span, with an extreme height of 122 ft. to the rails. The arches are of brick, and are shown on the section as 1 ft. 6 in. thick, or one-twentieth of the span. The width of the arch is 28 ft. The weight of the arch, spandrils, and backing is 312 tons, exclusive of parapets, or rather less than ten tons per foot linear of bridge, from centre to centre of pier. The load, as before estimated, is 138 tons, making a total pressure of 450 tons for the spans, of 34·5 ft. The resulting weight to be borne by the piers is thus equal to about 13 tons per foot run of centre line. This weight, compared with that before given of 6 tons per foot run, shows an addition of 7 tons per foot run for the weight of the arch, taking a 30 ft. span.

The piers on this viaduct measure, on plan, 4 ft. 6 in. by 28 ft. at springing, or 126 square feet, sustaining a pressure of 3·57 tons per square foot. At 116 ft. lower, the area is enlarged to 7 ft. 6 in. by 28 ft., or 216 square feet. The resulting pressure on the base of the piers, comprising the weight of the arch, that of the pier itself, and that of the maximum load, is 6·7 tons per square foot, showing that the engineer accurately calculated the taper to be given to his piers.

Proceeding to inquire, in the first instance, as a matter of practice, into the increase of the thickness of arch that accompanies the increase of span, we take the example of the Royal Border Bridge, over the river Tweed, which was completed in March, 1850. This fine viaduct consists of twenty-eight semicircular arches, each of 61 ft. 6 in. span. The total length is 2,160 ft., and the extreme height 129 ft. The bridge is divided into two portions by a central abutment. The width between the parapets is 24 ft. The piers are 8 ft. 6 in. wide under the springing, increasing almost immediately to 10 ft. The area above the footings of the highest pier is 11 ft. 6 in. by 26 ft. 3 in. The arch, where it rises free of the backing, is 2 ft., and 7½ in. thick. Thus measured, to-

gether with the backing and spandrels, contains about 754 tons of masonry. To these has to be added 280 tons for the moving load, making a total pressure of 1,034 tons per pier, or about 5 tons per square foot of area. On the base, exclusive of the relief afforded by the projection of the footings, the pressure is about 7.2 tons per square foot; the total cubic contents of the arch, backing, and pier, being about 31 tons of masonry per foot run of the centre line of the viaduct, almost evenly divided between arch and pier.

We thus find, not as a matter of theory, but as a deduction from practice, taking two very admirable examples of the work of the bridge-builder, that the quantity of masonry per foot run for the 60 ft. arched viaduct is, as compared to that for the 30 ft. arched viaduct, as 31 to 13; or, abstracting the weight required for supporting the moving load alone, before taken at 6 tons per foot, we have a platform or arch weight of 7 tons per foot run, for a 30 ft. span, compared with one of 25 tons per foot run for a 60 ft. span, which is not very far from 4 to 1, the relation of the squares of the spans. And it will be remembered that in each of the arches cited the thickness of the ring is in a like proportion to the span, being almost exactly one-twentieth part of the same. The observance of this proportion might have led to the anticipation that a greater economy would be effected by the use of larger arches. It is thus the more instructive to take out all the quantities of a span of masonry, including piers, as well as arch and backing, as by this means we arrive at the certitude that, in the additional cost attending other things being alike, on the wider arch practice accords fairly with theory.

This thickness given to the arch, in proportion to the span, is much greater in the brick arches of which we have been speaking, than is the case in some of the most celebrated stone-bridges of recent times. Of these we cite the cases of five famous bridges,—two English, two Welsh, and one Italian.

Name of Bridge.	River.	Span.	Key.	Proportion.
Pont y Cysyllte	Taaf	140	2·5	1 to 56
Waterloo	Thames ...	120	4·5	1 to 26 6
New London...	Thames ...	152	4·75	1 to 32
Chester	Dee	200	4·0	1 to 50
Turin	Dora Grossa	147	4·92	1 to 30

Of these five bridges, those over the Taaf and the Dee are of limestone, and the other three are of granite. The boldness of the two former structures is as noteworthy as the architectural beauty of the others. The first-named bridge, the work, as we have before mentioned, of William Edwards, a self-trained country mason, approaches wonderfully close to the limits of scientific precision. The thickness of the key-stone is only one fifty-sixth part of the span. The voussoirs are ashlar, but the rest of the arch is only coursed rubble. The pressure at the crown, according to an analysis to be found in vol. v. of the "Proceedings of the Institution of Civil Engineers" (p. 472) is equal to the weight of 938 cubic feet of masonry per square foot, and that at the second point of rupture (or rather where rupture would, if anywhere, occur) is 936 cubic feet per square foot. Allowing 1¼ cwt. per cube foot for the weight of the limestone masonry, we have thus a weight of 70 tons per square foot of section. This is less than half the crushing limit of magnesian limestone, which, according to Fairbairn, is 1·36 tons per square inch. But it is pretty certain that the bridge would not have stood if built in brick. In that case the weight would have been 46·6 tons per square foot (supposing the dimensions to be the same), but the resistance, according to Mr. Clark, is only ·232 tons per square inch, or 33·4 tons per foot. The rise of the arch is 35 ft., and the radius of the arc which it forms is 87 ft. 6 in. Neither the cost of the bridge nor the cubic contents of the masonry is stated in either of the three accounts of the structure to which we have referred. It is hard to form an opinion how far Edwards was guided by the instinct of genius and how far by geometry and knowledge of the strength of material, but it is highly instructive to observe the light and graceful form of an arch constructed of rough limestone masonry, of dimensions which would have caused a collapse as soon as the centre was struck had they been executed in brick-work.

We may take the 200 ft. span of the Dee Bridge as the practical limit to the width of the stone arch. As to brick, if firebricks set in cement be employed, the material may be equal in its resistance to stone. But as far as ordinary brick set in mortar is concerned, we apprehend that 120 ft. may be taken as the practical limit of span. This has been reached in India, in an arch of 4 ft. wide. But the mortar there is exceptionally good. Indian builders adopt the Italian method of wetting the lime for their mortar at the very commencement of the work, and keeping it constantly wet. Some lime which had been thus prepared by Tippoo Sahib was long after used by the English engineers at Seringapatam, with fully satisfactory results.

With regard to cost, that mode of comparing the excellence of one method of structure with another depends on so many conditions that the simple statement of cost per foot run is not in itself fully instructive. In the case of the bridges that we have cited, the cost was as under:—

Work.	Feet run.	Cost.	Per foot run.
		£.	£.
Lockwood Viaduct ...	1,428	33,000	23·1
Royal Border Bridge	2,160	120,000	55·5
Dee Bridge	426	49,900	126
Dora Grossa Bridge...	320	56,000	180
London Bridge.....	782	1,028,000	1,383
Waterloo Bridge	1,280	1,050,000	821
Thames Tunnel	1,200	454,810	379

With regard to the above prices, the first two apply to viaduct alone, without approaches. In the other case the cost of approaches is included. In the Dee Bridge the approaches cost 7,500*l.* In the Dora Bridge the cost is not distinguished. In Waterloo Bridge the land cost 373,000*l.*, and the approaches cost 112,000*l.* As to London Bridge, full particulars of the work and designs are to be found in the autobiography of Sir John Rennie, but he is remarkably reticent on the subject of cost.

THE LATE MR. J. H. HAKEWILL, ARCHITECT.

We mentioned briefly in our last the death of Mr. John Henry Hakewill, at his residence in Inverness-terrace, in the seventieth year of his age, surviving his most intimate friend, Mr. Benjamin Ferrey, who lived in the same terrace, only eight days. Mr. Hakewill belonged to an artistic family. His father was the architect of Rugby School, and of many other public and private buildings, and one of his uncles was the author of Hakewill's "Italy." His brother, Edward Chas. Hakewill, who died a few years ago, was also an architect, and erected some good churches.

John Henry Hakewill, whom we now lament, was articled to his father, who died when John was only nineteen. His friend, the Hon. and Rev. Wm. Spenser, early employed him to rebuild his church at Erchfont, in Wiltshire, and this led to many works in that county, both in churches and parsonage-houses. He built Howbury, near Wallingford; Boulney Court, near Henley; the County Hospital at Bury St. Edmunds; and more recently Stowlangtoffe Hall, near Bury St. Edmunds; and he was also engaged on many churches, schools, and parsonages in many counties, especially in Suffolk, Essex, and Wilts. He had not many works in London, the Rectory, St. James's, Westminster; the Boys' School, Marylebone; and the *original* of St. Matthias's Church, South Kensington, being the principal.

Mr. Hakewill was elected a Fellow of the Royal Institute of British Architects in 1854. He was one of the consulting architects of the Church Building Society, and with a few intimate friends assisted in originating the Architects' Benevolent Fund. Not longer ago than March last Mr. Hakewill communicated to us some curious memoranda, left by his father, concerning the visit paid by the Prince Regent and other illustrious persons to Oxford, in 1814, which will be found in our volume xxxviii., p. 339.

Camberwell.—St. George's Church, Wells-street, Camberwell, has been re-opened, after having undergone extensive internal repairs, which have been carried out by Mr. L. C. Shipton, of Camberwell. The pulpit has been carved and decorated by Mr. R. C. Baker, its donor.

THE NEW MUNICIPAL BUILDINGS FOR GLASGOW.

THE award of Mr. C. Barry on the competitive designs for the new municipal buildings for Glasgow was unsealed on the 2nd, and it was read by Dr. Marwick, the town clerk, at the usual monthly meeting of the Town Council, over which Lord Provost Collins presided.

Mr. Marwick read the report, which stated that Mr. Barry had made two lengthened visits to Glasgow, and had devoted a great deal of time to the consideration of the ninety-six sets of designs sent for competition, comprising in all 724 drawings. He had taken twenty-one of the best designs, and had himself priced them out. Of these he had selected three of the best that he could put before the Corporation, apparently coming under or about the 150,000*l.* Of these three designs he had shown in tabular form the cost, taking as the basis the cubical contents deduced from the plans and the information therein as to height of stories, &c. He also took into consideration the least cost that, in his judgment, each of the three designs could be well executed for in a solid, durable, plain manner, without marble or expensive sculpture externally or internally, for which purpose a large extra sum could be appropriated in any design carried out. He placed these three designs before the Corporation, and thought that the premiums must be awarded to them, inasmuch as they most clearly were in accordance with the embarrassing letter of the instructions. The mottos of three designs were:—First (1), "Carton," estimated by the author to cost 150,432*l.*, his plans being 89, 90, and 91. The cost at the same rate of Mr. Carrick's plan, which was 150,000*l.*, would be 158,800*l.*, and the cost as estimated by Mr. Barry, without expensive sculpture, would be 220,000*l.* The second place is awarded to the plans marked "Fidelity." No estimate is given of the cost; but, according to Mr. Carrick, the cost would be 151,000*l.*, and according to Mr. Barry, about 200,000*l.* The third is given to the motto, "Let Glasgow flourish for ever," which the author estimates at 143,728*l.*, but according to Mr. Carrick it would be 141,500*l.*, and to Mr. Barry, 188,000*l.* Mr. Barry stated that there had been sent in designs of much superior merit to any of the three which he had selected, but also more costly, though not in his opinion too costly for so important a city as Glasgow. The cost of these ranged from 180,000*l.* to 250,000*l.* He regretted that, as he was bound by his instructions, he did not feel at liberty to mention these.

The Lord Provost stated that, on opening the envelopes which accompanied the designs mentioned, it was found that they had been contributed as follows:—That with the motto "Carton," by Mr. G. Corson, architect, 25, Cooperage-street, Leeds (750*l.*); "Fidelity," by Messrs. Coe & Robinson, architects, 4, Furnival's Inn, London (500*l.*); and "Let Glasgow flourish for ever," by Mr. E. Clarke, architect, 6, Adam-street, Adelphi, London (250*l.*).

It was stated that Mr. Barry had also sent a private letter to the Corporation, and it was agreed not to publish the contents of it without his consent.

GLASGOW MUNICIPAL BUILDINGS COMPETITION.*

IN response to an invitation issued some time ago for architects to compete for the elevations of the Municipal Offices at Glasgow, the plans of which were prepared by the City Surveyor, ninety-six sets of designs have been sent in, as mentioned above. The building is to occupy a rectangular and almost level site in George-square. The square having some of the most handsome Classical buildings of all the handsome buildings of this Classical city facing on to it, the designs were to be strictly Classic. The design to which the first premium is awarded is by Mr. Corson, of Leeds, and we will endeavour to describe to our readers the frontages, beginning with the principal one to George-square, which has double pilasters between the windows on the first floor, with colonnade between the windows. These columns support a moulded enriched cornice. The blocking course is circular, and on this rises the attic story, which is treated similarly to the first floor, with columns between

* From a Correspondent.

the windows, and above, again, a cornice similar to the lower one, with balustrade. The angles of the buildings project, as Mr. Brodrick makes all his buildings, particularly the Leeds Town-hall, and the central portion next to the entrance is brought forward and supported by double columns at the ends, and filled in between with a three-light window over the principal entrance. Above the window is a pediment with moulded cornice and coping, under which is a group of carved figures. Above this central pediment rises a tower which is, however, not strong enough, being as slender as that of the Bradford Town-hall, and having the appearance of being top-heavy. The lower portion of the tower is well finished, and the upper part arranged for a bell-tower. At each side of the main entrance are projecting piers, with niches for statues, finished at the level of the roof with pediments. All the cills project so as to form a balcony around, and are supported on corbels. The basement windows have square heads, and all the others are circular, with moulded archivolts to them, and the space between the windows on the ground-floor is panelled. The windows to the ground-floor are of similar character to those of the first floor, but shorter, with carved panels under. The angles of the buildings are finished with mansard roofs, breaking the outline in a picturesque manner. The George-street and Cochrane-street frontages partake of the character of the George-square frontage in the position and size and shape of the windows, with pilasters or panels between, but the central part is broken by the entrance to the quadrangle, and Mr. Corson has treated this well. The arch is enriched, and the spandrels filled in with carving; at each side of this entrance are projecting piers similar to the entrance to George-square, with niches for statues. There are, again, three lights over this entrance. On the cornice of the roof and over all the double piers are placed turrets. A dome is shown over the entrance to the quadrangle on George-street, with gable in the same and three-light attic window, which is far better proportioned, and looks better altogether, than the tower to the front. A slight alteration is made between these two frontages, that to Cochrane-street having plain square tower. A great fault in the John-street frontage of this design consists in having no definite mode of distinguishing which part of the building is intended to be used as the town-hall, otherwise the John-street frontage is as expensive as any of the others. An area wall around the building is utilised to form a place for statues. The drawings are well got up.

"Fidelity," by Messrs. Coe & Robinson, to which the second premium is awarded, is as different as possible from the design previously described. The ground-floor and basement are rusticated. The ends and centre project. At the level of the first floor runs a moulded cornice of a decided Doric character, and above this the central projection forms itself into a pediment, supported by six Corinthian pilasters, two on each side, and one between each window, while the pediment is further finished with a carved group of figures. The end projections receive dignity from the four pilasters to each, which are fluted three-fourths of the distance down. The space between the central and end projections is perfectly plain, leaving the other portions conspicuous. The whole of the window-heads of the basement and ground floor are square. The first-floor windows have also square heads, and have moulded jambs and corbels to support the moulded canopy over, while the window-heads between the pilasters have relieving arches thrown over, the under side of which is carved; but the key-stones of these arches are disproportionately large, and wreathed around. There is only one tower to this design, fronting George-square. The base is vermiculated, and over this are three windows, with columns between, and double columns at the end support the cornice, which, examined in detail, is the nicest part of the structure. The whole tower is placed on a square platform, and groups of figures occupy the corners. But one drawing is used to show the Cochrane-street and George-street frontages. The entrance to the court in the centre projects, and has a semicircular arch over two pilasters; and two columns over support plain pediments with dentils in coping, and cornice ends project and have double columns at the ends and single columns between the four windows. Groups of figures are placed over the entrance in the pediment. An infinity of time has been spent in making drawings of the ceilings, which are elaborately drawn and do great credit to the draughtsman.

"Let Glasgow Flourish, A," by Mr. E. Clarke, the recipient of the third premium, is a design in some respects better than the others, and any exhibitor in the room might learn something from it. The frontage to George-square shows an ashlar basement and a rusticated ground-floor, above which is a cornice with good bold ancones under. The first floor, rising from this cornice, deserves to be described in full. At each end a single-light window is arranged, with three columns on each side and a canopy over, with enriched cornice and coping; between all the other windows two columns are placed, and all the windows have square heads with small canopy over, without any carving; but all the windows have moulded architraves. The central portion projects with three pilasters at each end, which support a large pediment with carved group of figures. There are three semi-circular-headed windows in this central projection, and pillars between. Square heads would have been more effective. Over all this story runs the main cornice of the building, backed up by a perfectly plain attic story, with plain square-headed windows. Probably it would be better if statues were placed between each window on the attic-story. A small cornice, not at all obtrusive, surmounts the whole building, and above, at angles over the canopies before specified, are angle-turrets. But the thing that marks this for a prize design is the carefully-proportioned central domed tower, with turrets at angles on a square platform. The tower is circular on plan, and pilasters and windows alternate around. Above are cornice, colonnade, and cupolas. The dome which rises above is very gracefully proportioned. The ground-floor of this elevation is not good. The entrance is by three doors, fairly good but for the pilasters between, which are out of place. This design is one of the few that are not coloured, and exhibits more real merit than many of them. The elevations to Cochrane-street and George-street are similar to each other. The ends are exactly similar to the ends of the George-square frontage. The entrance to the court is badly treated in most of the designs, and in this one it is not an exception. From the drawing, the quadrangle appears to be expensive, but it is one of the best quadrangles in the collection. In the John-street elevation the windows over the cornice are similar to those to George-square, with canopies over, while the main cornice is interrupted by a pediment over the entrance to the hall offices. A very neat dome is placed above this, which is not thrust conspicuously forward, and adds a great charm to the elevation.

Several rooms are filled with designs, and it is obviously impossible to go over them all carefully, so we shall select a few of the best; foremost among which we recognise the carefully-studied drawings of Mr. William Hill, the author of the Bolton Town-hall, signed "Adelensis." This shows three-quarter pilasters from the level of the ground-floor, two stories high, over the rusticated basement, while the architrave finishes around the pilasters to the first-floor windows. The parapet above, following the lines of the cornice, forms cills for the windows, and pedestals for figures of all the kings and queens of Scotland, to which a dignified Classical attic story forms a fitting background. The attic windows have pilasters and cornices; and above the whole, running around the building, is another cornice surmounted with an open parapet, with vases above, each end finished with small angle-turrets. The entrance is through three doors, with pilasters. Above is a tower, rather slender, but suitable in every way for the style of building, placed nearly in the centre of the building, with rusticated basement, and colonnade over, and vases above columns. On each side of the central tower are bell-turrets in harmony with the central tower. The elevations to Cochrane and George streets are spoiled completely by the entrances to the quadrangle; if they were away this design would be enhanced in value considerably. It has pilasters on each side similar to the front on a similar rusticated basement. The moulded frieze is taken back the depth of the reveals of the windows and forms moulded imposts to the same. A small room is obtained in the turret, and forms a central object in these frontages. The windows over the arches are richly carved. The elevation to John-street is spoiled by the author trying to keep within the cost specified; and it is easily seen he has reduced the expense on this frontage by having no pilasters between the central projection and the projections at the ends, and otherwise cutting down the cost where practicable. The entrance to the town-hall is the best in the exhibition, and the design could be carried out for the money intended to be spent.

"Classic" may come next. The walling is bosted, with sunk joints. Square heads are shown to all the windows. The three entrances have circular heads. The ends and centre project as in other designs. There are two pilasters at the ends of the central projection, and six columns between the windows, supporting a moulded frieze, with wreaths carved on, and cornice and colonnade over. The windows on the first floor have circular heads, square canopies over, supported by large corbels; ends have similar windows, but with pediments over, carved. The second-floor windows are circular, and between every window circular-headed niches for figures are formed. Each story is treated separately. There is a good tower, and well-proportioned dome over. The author shows an alternative plan, with a slender tower, with clock in same, and no columns in the design throughout, the centre being sufficiently marked by the position of the tower.

"Clyde" sends a good design, showing a rusticated ground-story, with frieze and moulded cornice, on which rise pillars between each window. The angles and the entrance project forward, and have very good turrets, raised one story, admitting of figures in the niches. The pediments are filled with carved figures over the entrance. The ground and first-floor windows have circular heads, and the attic has square heads, finished just under the cornice. The area-wall is bold, showing a decided line. "Clyde" also sends another design, showing rusticated basement and ground stories, and Ionic columns to the first floor, supporting cornice and colonnade, above which is the attic story, with dormer lights. The whole is too enriched and foliated, but it has a good cornice and colonnade.

"Civis sum," by Messrs. Campbell Douglas & Sellars, shows a ground-story formed with one window in each angle, which is projected forward, and has bold moulded archivolts around. The three entrances are also treated in a similar manner, while the portion between the ends and centre is recessed, and has three windows with moulds around. The windows to the first floor have Ionic columns supporting moulded frieze, used as a head with canopy, and the space above filled in with moulded arch, with small figures under on the cornice. The pilasters are two stories in height, with Corinthian caps and moulded frieze; in a line with them there is a deep cornice, blocking, and colonnade. The angles in the attic story have horseshoe-shaped windows, which are anything but in keeping, and turreted roofs over. There are two bell-turrets next the tower, which is octagonal, and after the style of Wren's tower at St. Stephen's, Walbrook.

"Lippen to me, but look to yourself," has a good elevation, with rustic basement and panelled ground-story. There are square heads to all the windows throughout, a plain frieze, and plain projecting blocking course with bed-mould, above which rise Corinthian columns two stories high, the windows between having carved panels under the first-floor windows, and under the second-floor window cills a key pattern string-course. There is a deep frieze, splayed blocking, and richly carved pediment over the entrance, and a nicely-proportioned dome is over the clock-tower, square seats at the ends being reserved for groups of figures. This is the design of Mr. Salmon, of Glasgow.

"Spes Dulce Malum" is a very well-drawn design, by Mr. Burnett, sen., finished in a pale ink, somewhat Florentine in style, with rustic ground-story and projecting piers for statues between centre and angles, making each appear recessed. There is only one entrance, which has a semicircular arched head. There is also one window in each end with similar semicircular head, and three others, forming an arcade between the ends and the entrance. The windows are not satisfactory.

Mr. James Barlow Fraser sent a shaded drawing, under the motto "Royal," which shows a vermiculated basement, with square heads to the windows, and similar windows to the ground-floor, with entrances in the centre with arched

heads. The columns rise from the first floor to the roof, with Ionic caps in the central and end part of the building. The plans are very well drawn, but there is a desperately ugly dome, with the clock-tower under. There are three pediments, and the centre one is carved, and all the windows above the ground-floor have canopies over them. The design that comes next was, we may say, universally admitted to be one of the best drawings in the exhibition. It is, however, impossible to mistake it for a Classical building. The motto is given as "S. P. Q. G."

"Roman" occupies his first and ground floor with a range of pilasters. The angles and the centre project. Central columns support a cornice projecting 5 ft. 6 in., and the attic story comes on as a blocking course. This is a decided mistake. The first-floor windows have pediments over them, and the angles are raised a story, and finished each in four turrets. The tower is considerably too large for the building. There is a small cornice over the attic story.

"Suum Cuique," another shaded drawing, is by Mr. William Teit, of Glasgow. Each story is treated separately. The ground-floor has square-headed windows, and the first floor has also windows with square heads, but they have canopies circular and pointed alternately over them. The turret is peculiarly ugly, and is supported by four columns.

"Old Tee Square" has a vermiculated ground-story. In the centre are the principal doors, and over these are well-drawn fluted columns in the centre, and square columns elsewhere between each window. These columns are all two stories high, and there is a pediment in the centre with group carved therein.

"Why not?" has pediments at the ends, and central tower, large circular head to door, with projecting piers at each side, and large circular heads to windows on the first and second floors, while there are nicely-moulded window-heads of a reasonable size to the ground-story.

"Let Glasgow Flourish" (red ink) has a vermiculated ground-story with columns above two stories high, central pediment with frieze and wreaths over, and carved figures in the pediment. All the window-heads are square.

"Mottoes only" has ground and basement story rusticated and plain; small projecting pediments in centre; the ends also project. There are shown three doors, with pillars above between windows. Connected with colonnade is a deep perfectly-plain frieze and cornice, with colonnade over. Angle-turrets are placed at the ends and square tower, but the attic over the centre pediment is dwarfed.

"In Honour true," by Mr. Eaglesham,—a fanciful design. All the windows have circular heads. The ends are raised a story, and a horrible clock-tower is attached.

"Clutha," a design of Mr. Bell, is elegant; all square heads to windows, and each story is treated separately. The ground-floor shows panels between windows, and on the first and second stories columns are arranged instead between the windows. The windows have architraves, and the angles are raised one story. The clock-tower is passable.

The ground-floor in the design marked "B" has square windows. The design is of astylar composition. There are gables at ends, and a gorgeous turret. The town-hall is well marked.

"G" is very dignified. The columns commence at the ground-level, and are two stories high. There is a centre pediment, and the ends project. There is a colonnade and cornice over, and panelled attic story. The ends are surmounted by domes, and a large dome is shown in the centre.

In "Aiblins," Mr. Maclaren shows a basement battered, which gives an appearance of stability. There is a string on the level of the ground-floor, and the windows have square heads; the walling on the ground-floor is panelled. On the first floor great arched openings are evidently intended to represent Classical windows, but we fail to see the correspondence; there are three windows in each bay, and one at each end. There is a small pediment in the centre, and square windows to the second floor in the frieze. Pilasters are shown to the ends and centre dwarf domes, with buttresses around.

"1880" is a well-drawn and fair design. Entrance is very tame,—too much sameness.

We believe Mr. Thompson sent "Cavia," a good design, and it would have been better without pilasters taken up three stories; panelled ground and first floors, and fluted pilasters above at the ends, over which are well-shaped domes.

"Nitor" is a good design lost among so many others. The columns, of the Corinthian order, are two stories high from the first-floor level, and there is a panelled frieze above the angle-turrets and pediments: ugly stone transomes are shown to the first-floor windows, below arches. The centre projects, and there are figures in the pediments.

"Finis coronat Opus:" effective front, columns between each window, and two at angles. A pediment is shown in the centre, and the colonnade at the level of the attic story, above the windows and statues, looks well, but the pediment is much too large. There are mansard roofs over the angles, and large tower, and circular dormer window.

Mr. Stark sends "Palladian," which has Corinthian columns to front, fluted from ground-floor two stories high; the ground-floor windows have square heads, and the first floor circular; the cornice frieze, and colonnade over these windows are 15 ft. high. The attic windows are placed in panels with statues between.

"City Chambers," by Mr. J. Bierd, has the ground-story panelled with vermiculated quoins and archstones to heads, angle-turrets too lofty. The central projection is supported on wide, heavy pilasters, resting on slender ones, with domed roof and good dormer windows.

The walling on the ground-story to "Palladio" shows the joints sunk. There are some good corbels to support the cornice, and a central pediment is placed on the George-square front, supported by eight columns, while the end projections have four similar columns each. Over the pediment is a central domed tower, and turrets are also placed over the ends. The colonnade and cupolas are too lofty. All the windows have square heads, with canopies over, those to the first floor being circular, and those to the second floor pointed.

The following are the mottoes of various other designs that have been sent in:—"Experience," a building four stories high; "Progress" is spoilt with having no lights on the second floor; "Peace, Progress, and Plenty," an Egyptian study, very good, but out of place in Glasgow; "Fiat lux," too lofty, and perfectly plain; "Speedwell" vermiculated and plain courses, alternately, to ground-story, and very neat upper-story, supported on corbels; "Bourgeois" (by Messrs. Turnbull & Thomson), no columns, central part with angles raised a story, the centre part projecting, and the basement battered; "Ad rem" has three pediments, the centre one with six Ionic columns, and the outer ones with five columns each; "Finis coronat Opus" very similar, but the centre pediment is larger than the outer ones, and it has a better tower; "Salonica" is a well-drawn design, the centre and ends are three stories high, and between these the building is two stories high; "Apropos," a highly-shaded and coloured drawing; "Art with Economy," very plain; "Light and Shade," "Centre of Commerce," "Motto," "Town Hall," a sketchy, Gothic drawing; "Civis," "Grecian Doric," "Tree, Bird, Bell, and Fish," "Rebaiothe," "Conor," "Immutatus," "Per non Dormire:" the centre and angles project with panelled quoins at the ends and columns between, and very good dome; "Non quo sed quo modo," a poor design, covered with the Broomhall tiles; "Our will became the servant to defect, which else should free have wrought;" "Con amore" motto, St. Mungo, is a good design, and deserves a better place in our report. It has a rustic basement, and the columns are two stories high, with attic over and centre pediments, each with dome over. It was said to be by Mr. Anderson. Mr. Landless also sends a drawing, signed "St. Kentigern Primus." It is plain, with a good central dome. We should advise this young Glasgow man to persevere, as he will obtain prizes in time. "Child," by Mr. J. Thomson, Glasgow. "Let Glasgow flourish." "Justice," sketchy, and very poor. "Let Glasgow Flourish," with fish and mitre. "Glasgow floreto," columns too heavy, and too near together. "Experto crede," very gaudy. "Ex propriis St. Mungo," two lofty turrets at the ends. "Bruce," "Bannockburn," "Mendelssohn," "Quivi Trovammo," "Two Circles," "Nisi Dominus Frustra," "Simplex," "Let Glasgow Flourish," "Concilio et Labore," "Georgiana-square" by Mr. Love; "Revirescam" by Mr. Dalglish; "Curia Municipalis," windows coloured. Mr. Baird, jun., was not successful in making his mark with a design signed "My Mark," and we are not astonished. "Red Star," "Ca' Cannie," "Festina lente"; "Major Domo," enormous dormer and central pediment; "Detur Digniori," a decided Queen Anne. "Desideratum" is well sketched; "Valentine Clyclone" is by a disciple of Queen Anne; and "Athens," a Grecian drawing, is reported to be designed by a German.

THE PROTECTION OF WOOD AND IRON BY PARAFFINE.

DR. EUGEN SCHAL gives some interesting information on this subject in the *Würtembergische Gewerbeblatt.*

In chemical technology great difficulties sometimes arise when it is desired to manufacture on a large scale preparations which may be obtained with ease in the laboratory. In most cases the reason of this failure is the fact that in the manufacture the use of glass, porcelain, platinum, &c., which successfully resist the effects of the various chemical agents must be dispensed with, and cheaper and less easily breakable materials, such as iron, copper, lead, and wood, substituted. Wood especially cannot be replaced by any other material in the wholesale preparation of muriatic lyes, although the same, according to the strength and temperature of the liquid, undergoes sometimes very rapid destruction.

Dr. Schal says he acquired this experience more particularly in 1874-77, in alizarine manufactories, and that he found in paraffine a means which efficiently protects the wood against damp, acids, and alkalis, and by which a great saving is effected. The wooden vessels used, especially tanks of pine wood, for boiling acid and alkaline lyes, as well as casks of oak of the heaviest weights, for separating acid alizarine lyes at a pressure of a half to two atmospheres, were generally totally rotten after a few months, but they lasted for two years when impregnated with paraffine.

Before treating with paraffine, however, the vessels must be thoroughly dried for about three weeks by leaving them in warm and dry air, in order to prepare the wood for the absorption of the paraffine solution in its pores. The latter solution is prepared in the following manner. A part of the paraffine is melted in a spacious metal vessel over a moderate fire, the mass being stirred, the boiler taken from the fire, best moved into the open air, stirred until the mass begins to congeal at the edge, and then about six parts of petroleum, ether, or sulphuret of carbon are poured in, and stirred until solution. The preparation is then put into vessels that may be hermetically closed, or it may be used at once. In preparing the paraffine solution great care must be exercised, as paraffine as well as petroleum ether or sulphuret of carbon especially are very inflammable, and as even the vapour of the two last-mentioned substances, if mixed with air, may give rise to dangerous explosions. Those substances must, therefore, be kept in a cool space, far from light or fire, and well stoppered.

The wood is best saturated in dry and warm weather, as then it dries more quickly, and a smaller quantity of the solving agent is necessary. In winter six parts of the solvent generally do not suffice. This proportion changes with the quality of the paraffine and the temperature; paraffine solving with difficulty is better than the more readily soluble article. Vessels easy of access, such as tanks, tubs, &c., are coated in the open air with the solution as long as the wood will absorb it. The solvents evaporate very quickly, leaving the paraffine behind, so that two or three coatings may be laid on in succession. If the vessel is to be exceptionally well prepared, it is left for a day to dry, and then another layer of the paraffine given.

For vessels in which steam is used for boiling the liquids they contain, he applies after a few days a coating of oil varnish, because the melting-point of paraffine is below the boiling-point of water, and it is thus in time driven out of the pores by the water.

Instead of oil varnish, the vessels, after being well rubbed down, may also be coated with a thin solution of soluble glass, then dried, and washed with diluted hydrochloric acid. The silicic acid thus formed clogs up the pores from the outside, and provides a protection to the paraffine against the hot water. For vessels which are used only with a moderate heat or cold, the coating of paraffine suffices perfectly. The paraffine is hardly dissolved by diluted cold

alcohol, is not poisonous, and may also probably be used with advantage for vessels for keeping liquid. In the case of barrels, the solution was poured in simply after drying them; for an oak barrel holding 9 to 10 hectolitres, 1 kilo of paraffine dissolved in petroleum ether was required. All openings were then well closed and the barrel rolled about and over for about an hour, so as to bring all parts in contact with the solution. The barrels were finally left standing on their ends for half a day, after which time the remainder not absorbed was emptied, and used for the outside coating. Before applying the solution outside, however, the barrels must be well cleaned, for dirt naturally closes the pores of the wood. As these barrels were very expensive, and had to sustain a pressure of two atmospheres, besides being exposed to a high temperature, they received on both sides an additional coating of oil-varnish. It is, however, necessary to let such a barrel stand in the open air at least a fortnight for drying, and as a precaution fire must be kept away from the barrel while being prepared. As a further precaution, in applying the solution inside, the workman must not be left alone, as it frequently happens that stupefying vapours from the solvent of the paraffine arise, which stupefaction, however, soon disappears in the open air. The oil-varnish may also be diluted with petroleum ether, poured into the barrel, and then the latter rolled about, as above described; but many places escape saturation in this operation. After coating with varnish, the barrel is once more dried, and then filled with water, in order to force out the combustible gases. This is much to be advised, as an explosion once took place in consequence of a workman trying to enlarge a hole with a red-hot iron, contrary to orders. After the last operation, the inner sides of the various vessels are rubbed down with a dry duster, so as to take off all loose particles.

If impregnation of wood is intended on a large scale, the wood is best stacked in iron boxes, the paraffine solution poured over it, the solution not absorbed drawn off after some time, the solvent forced out of the wood by means of warm air, and recovered by condensation in a cooling apparatus.

If the various manipulations are carefully carried out, the duration of vessels thus prepared is increased from four to six fold, while the outlay is comparatively small, leaving out of consideration that the contents of such vessels are frequently lost by the bottom being forced out.

Paraffine, melted with equal parts of linseed oil or rapeseed oil, is also useful for coating iron vessels, which without a substantial preservative are very liable to rust in manufactories of chemicals.

Paraffine likewise protects skin efficiently against wet, alkalis (especially lime), acids, &c.

Dr. Schal says he often found that workmen in alizarine factories suffered much from sore, ulcerating, and swollen hands, especially during winter. After the workmen began to use (twice daily) a solution of paraffine with rapeseed oil and petroleum, chapped hands (not to mention swollen or ulcerated hands) became a scarcity.

The solution is produced by melting three parts each of paraffine and rapeseed oil, removing it from the fire, and adding eight parts of petroleum while stirring the mixture. Before using, the solution is stirred a little, and the hands rubbed with it while they are clean and dry. In larger factories, earthenware and tin vessels, filled with this ointment, are placed at convenient spots, and it is believed that the manufacturer as well as the workman will find this pay.

New Congregational Chapel, Northampton.—The foundation-stone of a new Congregational Chapel, in King-street, Northampton, was recently laid by Mr. John Hensman. The new building will be faced with local stone and white brick, with terra-cotta and Bath stone dressings, moulded white bricks for strings, window cills, and cornices, from the Whitwick Colliery Company, Coalville, Messrs. Gibbs & Canning supplying the terra cotta. Mr. S. J. Newman, of Northampton, is the architect, and the work has been entrusted to Mr. Daniel Ireson, builder, of Derngate, Northampton. The cost of the new chapel, in the erection of which most of the old material has been utilised, and the expenditure, thus curtailed, will, it is estimated, amount to about 1,600*l*.

FROM BRUSSELS.

BRUSSELS, on the occasion of the fiftieth anniversary of its freedom from the Dutch rule, is in gala costume, and the national flag flutters from every window and across every street, recalling in all but the difference of the tricolor the *fête* at Paris a few weeks since. Unconsciously the comparison with Paris slips from under the pen. Brussels, every one carelessly agrees, is "Paris in little." There exists, however, as great a difference as it is perhaps possible to imagine, when the few hours' distance that separates the capitals of France and Belgium is taken into account. The stranger who hurries from the railway station to his hotel in the higher part of the town, and in the evening saunters down the Rue de la Madeleine and through the Galeries St. Hubert, attracted moth-like by the glitter of the shops and *cafés*, and heedless that but a few yards from him lies the picturesque old Grande Place, may, of course, think Brussels a little Paris.

Thank Heaven, however, in spite of successive burgomasters and energetic magistrates, there still remains, and long will remain, a large portion of the dear old Brabançon capital untouched, to delight future generations of seekers of the picturesque. After the imperial grandeur of Paris, the homely character of Brussels is delightful. Perhaps it appeals more to the domestic Englishman than to the boulevard-frequenting Parisian. The incidents that strike the eye are so different; the open small-paned window where the industrious housewife sits knitting, for the long winter, the comfortable stockings and vests so prized by the Low-Country folk; the narrow streets shut in and shaded by their picturesque gables; the homely costumes that surround one,—for machinery has not yet entirely triumphed over tradition; the honest-hearted greetings in the market-place, alive with its vendors of vegetables under their patched and weather-beaten umbrellas,—ever suggestive of sketches for the pocket-book,—these and a thousand other incidents, from the welcome given to the stranger to the wag of the tail of the brindled dog who trundles along so happily his burden of mirror-bright milk-pots, all breathe an air of Flemish comfort and domestic ease that finds no possible comparison on the banks of the Seine, where "the blessings of civilisation" are written on every feature to be met in the streets. Brussels is a capital, and yet delightfully provincial. The Parisian, therefore, will never love Brussels; but the Englishman who knows his Paris will, from a brotherhood of sentiment, if not perhaps of blood and of language, unfailingly be led to prefer the gay little capital of Brabant.

Brussels, now *en fête*, remains still the Brussels of always, less always the difficulty of finding accommodation. The strangers fill the streets of the capital; the provincials fill the innumerable *estaminets*, where gallons upon gallons of excellent *faro*, and, perhaps better, *brune* beer, are consumed amidst revelry whose chief charm lies more in its resemblance to the life of Teniers's contemporaries than in its approach to what modern "culture" and the studies of the Social Science Congress have led us to appreciate.

After the terribly modern aspect of Paris, where the toil of its business of pleasure is stamped deep on every face, it is delightful to find oneself almost transported back in these quiet streets to the realisation of the period which tradition has pictured to us as "the good old times," where all is not scraped by municipal authority every ten years, or built five and six stories high in lines laid down by the T-rule and square. It is the Continent proper, the ideal of foreign travel satisfied, while Paris remains eternally Paris, which, as Charles Blanc remarked but a few days since, is only loved by Parisians because there still exists enough of old Paris to rouse the joyous recollections of the past. Have a care, destructive mayors and magistrates, that in your love of modernising your old towns you do not destroy that warm affection we all feel for the homes in which we have been brought up. The Bruxellois loves his Brabant town, where he sees in after-life the scenes of his youth revived, as his father and grandfather did before him,—the old houses which unconsciously affect his imagination with their quaint picturesqueness, the *estaminet* with its high ceiling, its clean-sanded floor and shady coolness, the well-filled glass of honest beer,—impossible, by the way, to find in Paris,—the satisfying meal,—another difficulty on the banks of the Seine,—and homely comforts enjoyed by his ancestors, and which to him form the great features of his existence.

Purists may shudder at the boorish life, the *bourgeois* existence, the aspect of decadence that stamps each nook and corner of the quiet old Flemish and Brabant towns; but let us remember that this seventeenth century that strikes the eye at every turn was the great period of Belgian history, when after the gigantic effort that shook off the Spanish rule, Belgium, or rather the Low Countries, began that epoch of prosperity it has ever since enjoyed, when the cannon of her great three-deckers,—to the designing of which the decorative skill of Van der Velde was not ashamed to devote itself,—thundered within sound of London Bridge, when still the commerce of the East and West poured through the gates of the Flemish towns, and along the broad flat roads from Ghent, from Bruges, from Antwerp, and from Brussels, to Northern Europe; when foreign influence was stoutly combated, and new-fangled fashions took a century and more to wedge their way into a position, and then, even, never succeeded in taking a good hold,—a fact which nothing shows more plainly than the development in Belgium of the varied architectural styles that have swept over Europe since the Middle Ages. The Low Countries have accepted each of these, like poor Ophelia's rue, "with a difference," and Belgium, for this reason, will retain to the artistic eye, for many a century yet, a peculiar charm of originality due to the peculiar character of the nation.

Respect, then, lover of a purer art and purer periods, the strength of a people whose force was sufficient to resist the foreign influences that neighbouring countries allowed so easily to acclimatise themselves. When one travels abroad, one's tastes must be allowed to become eclectic, in the too-little understood foreign acceptation of that word. They must be riveted temporarily to no one period, to no one fixed idea, or many a pleasurable illusion will be destroyed, and many a disappointment met. Brussels is essentially calculated to try the strength of the prejudices that a home course of artistic study may have engendered. It completely satisfies the ideal of romance, the ideal of the existence of the past, while calm reflection leads one to remember the period to which the greater part of all this effect belongs.

At the present moment, however, it requires a power of abstraction more than usual, not to be affected by the general bustle which attends the *fêtes* and ceremonies, placarded programmes of which enliven with their bright colours the walls of many a gloomy old burgher's warehouse, with flags flying overhead and unusual gaiety in the streets. Brussels in this excitement is the capital of Belgium, but scarcely Brussels itself, except to those who know the town of old; true, the Grande Place, with its familiar features, is little affected by this gaiety, though high up in the air, under the gilt St. Michael and the Dragon, on the spire of the Hôtel de Ville, flutter a bundle of national tricolor flags. In the town, the talk is all of the great historic cavalcade, the success of the first "sortie" of which has led to two further representations. Certainly the cavalcade is all that in the present day we can expect in a thing of this nature.

Needless now to describe the procession in which the whole history of Belgium was represented in costume, the long struggle between the patricians and the burgesses, the communes, the brilliant reign of Philippe le Bon and his artistic and literary court, and the later rule of Maria Theresa, followed by a long series of allegorical representations of the great industries of the time, and the deputations from the various provinces, cantons, and communes of the country. By this feature alone, long will the fiftieth anniversary of the independence of Belgium be remembered.

The exhibition, of course, forms to the stranger the chief object of temporary interest in the city. Being a strictly national show, Belgium is thoroughly well represented in its art, its manufactures, and its science. There remains, therefore, much to be seen,—and said.

Builders' Benevolent Institution Dinner.—The annual dinner in aid of the funds of the above-named Institution is fixed to take place at the Freemasons' Tavern, Lincoln's-Inn, on Thursday, 11th November, Mr. T. F. Rider, president, in the chair. The committee will be glad to hear from volunteer stewards.

AMERICAN PROGRESS.

It is but natural that a country, whatever may be its size or importance, should look with interest to the period when the time for numbering its inhabitants should arrive, for then is the opportunity afforded for noticing whether its condition is progressive or retrograde; and in proportion to the vitality and energy of that country, so is the interest greater and keener, and the efforts to insure a true and accurate account more complete and exhaustive. The period of a census, indeed, is a kind of birthday of a nation, when stock is taken and its values ascertained; and as it is seldom an occurrence of anything like an annual repetition, it really becomes an inquiry of the greatest importance. In this matter England, which should be first and foremost, is almost behind every other nation, and seems to care, less than all, to know what way she has made in the last ten years, or to gain that knowledge of herself which is so emphatically useful for future guidance.

Our own census is looming big, and preparations are being made even now for taking it. Of all the European, American, or other censuses, it will be probably the baldest and the least instructive, going very little further than a mere numbering of the people, and wilfully ignoring the openings naturally offered of getting information as to the real condition of the people, social, religious, or industrial. It is very much to be regretted that our Government, either from a misplaced grudging of a few thousands extra (which are sure to be wasted in some other quarter) or from a fear of injuring its popularity with its political supporters, should have refused to allow the census to be made useful for anything but the bare figures of the population. Perhaps in ten years hence we may learn a little wisdom, and do then what America is doing now, viz., seeking to find out in what direction her giant powers are extending themselves most, so as to guide her energies more profitably during the next decade.

The industrial history of New England is not only a romance of itself, but is a romance almost of our own day; and although we in the old country are fond of pointing to the rapid development of some of our manufacturing towns, the rate of progress is thrown into the shade by most of the American towns; nor have we any reason to doubt that, in most cases, the progress is as sound commercially as it has been rapid. It will be instructive to note from time to time some of the principal American cities; for, it must not be forgotten that England and America are becoming so interwoven in commercial matters, and so closely connected by ocean steamers, telegraphs, and (very soon, probably) by telephones, that we all have a directly personal interest in her trade and manufactures, and cannot afford to talk of them as far-off things which do not affect us. Looking at America from an American point of view, there are many branches of the subject of her development which are deeply interesting, and which, perhaps, the *Builder* will touch upon at another time, such as the migration of industry from the Eastern States to the Western, and the consequent variations in the balance of the trade and commerce of the country. At present, however, we propose to briefly consider the population of some of the chief centres of the States, in connexion with their past and present progress. It is too soon, as yet, to obtain the statistics generally of the American census of 1880, but sufficient is known as to the numerical condition of the great cities to enable us to draw some conclusions that may be of interest.

The New England States of Connecticut, Maine, Massachusetts, Rhode Island, New Hampshire, and Vermont are all remarkable, from an industrial point; for not only were they amongst the earliest pioneers of trade, but they stand out from amongst their own people by their peculiar force of character, and by the perseverance and energy with which they have drawn into their own focus such a large proportion of American trade and manufactures. Let us take, for instance, the small State of Massachusetts and its capital, Boston, which, on the principle that Paris is France, may be spoken of in the same way with regard to the state. Boston, according to the present census, contains 352,000 inhabitants, an increase of 40 per cent. during the last decade. Whether this amount includes the neighbouring towns of Roxbury, Charlestown, Dorchester, and Brighton, which have spread out their wings so greatly as to have become suburbs of Boston, seems doubtful; but there is no doubt that the increase since 1870, when the census reports gave Boston 250,526 inhabitants, has been at a remarkably-rapid rate. Eighty years ago, the population was returned at 40,000, and the port was then spoken of as "doing a nice little trade" with the East Indies. The nice little trade had risen in 1849 to the value of 1,222,800*l.*, and by 1878 to 6,130,000*l.*

The six New England states of Massachusetts, Connecticut, Maine, New Hampshire, Rhode Island, and Vermont, are estimated to possess a capital in the shape of their manufactories of 108,173,840*l.*, and to employ 556,000 workpeople out of the total population of 3,362,000. The manufacturing capital of Massachusetts alone amounts to 56,576,720*l.*, while it has 317,000 artisans out of a population of 1,653,000. The greater part of these artisans are highly skilled, and contribute, together with the perfect machinery in use, to a very large production. Textiles are the main branch of manufacture, while second only to these is the boot and shoe trade, which keeps more than 1,400 factories in constant employment, turning out, one year with another, some 60,000,000 pairs of the value of 16,000,000*l.* Several of the Massachusetts towns are almost exclusively devoted to St. Crispin, and it is not too much to say that at least half the boots and shoes worn in the United States issue from this one little state. A single factory at North Brookfield makes from 5,000 to 8,000 pairs a day, giving work to 1,000 people, at wages from 5s. 6d. to 10s. The watch trade, again, is another marvel of rapid development, dating back for a very few years only since its commencement. It was but in 1850 when two Boston artisans, Allan Denison and Edward Howard by name, first opened a small workshop for watchmaking at Roxbury; but, finding the place not sufficiently quiet for their wishes, they changed their locality to Waltham, a little town about 11 miles from Boston, and here they established themselves on the banks of the Charles River. Although they demonstrated the feasibility of making watches by machinery, they failed in a pecuniary sense, not having started with sufficient capital, and the concern then passed into the hands of Mr. Robbins, who founded in 1858 the now celebrated American Watch Company. Considerably more than a million of watches have issued from this factory from then till now, and although they were originally intended and expected to supply the home trade only, their cheapness and excellence have caused a demand for them in foreign countries, England not excepted. Over 800 operatives are employed by this company, working eleven hours per day (except Saturdays, when the limit is nine hours), the men earning daily from 7s. 6d. to 11s., and the women from 3s. to 6s.

The little state of Rhode Island competes briskly with Massachusetts in industrial honours. Although she is only about 40 miles in length and 82 in breadth, possessing not more than 250,000 inhabitants, she counts 46,000 of these as working people, with an industrial capital of 13,320,000*l.*, while, according to the last census, the value of the manufacturing production was estimated at 22,280,000*l.* What the revenue may be according to the exhaustive inquiries of the present census (now being made) it is impossible to say; but it must clearly show a very great increase. The production of the state of Maine is estimated at 14,000,000*l.*, and that of Vermont at 6,400,000*l.*, the latter state having three specialities, viz.,—tanning, carriage building, and the making of scales and weights. Connecticut, in addition to her textiles, of which we shall have more to say further on, is noted for her hardwares, sewing-machines, axes, and agricultural tools, besides running Massachusetts closely in the matter of clocks. New Hampshire prides herself on her steam-engines and locomotives. Maine, that happy state where the people will neither drink themselves nor allow anybody else to do so, except an unlimited supply of water, was formerly nothing but a saw-mill or lumber state. This trade (a very important one, by the bye) still flourishes there, and is a valuable source of income; but lumber is rather an industry of the more primitive regions, where forests still flourish in their primæval glory and where "clearings" are the first thought of man. Maine still possesses a considerable area of uninhabited country, but she also has several active business towns, such as Portland and Augusta, which can show a fair proportion of mills and factories, with their battalions of skilled workmen. Massachusetts is *par excellence* the cotton-spinning state, to which succeed in order Rhode Island and Connecticut. But although New England may be counted as the Lancashire of America, it is by no means exclusively so; for, of late years particularly, the cotton trade has increased in a very remarkable degree in the Southern States of Georgia, Tennessee, and North Carolina. A great change is coming over the United States in this respect, as in many other industrial respects. It was possibly a mere chance that first influenced the establishment of mills in the New England states, but what fixed them there was the character of the country, and the ample supply of water-power, which commended itself at once to the notice of the early industrial settlers. The cotton in those days was, therefore, all brought from the South to the North, just as it is brought to Manchester, and it was not anticipated that a cotton-manufacturing element would grow up in the South. But it has done so, and to a by no means inconsiderable extent, that is increasing every year. The following brief table will show how the thin end of the wedge has been introduced, giving the figures of the Northern and Southern cotton-spinning States respectively:—

Northern States.

	No. Mills.	No. Spindles.	Pounds of Cotton used.
Massachusetts	206	3,775,634	2 8,894,352
Rhode Island	129	1,438,479	61,409,470
Connecticut	108	889,784	45,492,513
New York	60	615,205	28,473,469
Pennsylvania	60	451,9 0	31,572,305
New Hampshire	36	815,709	57,326,126
Maine	27	633,944	33,603,236
New Jersey	22	178,928	10,114,300
Maryland	20	127,352	21,368,020
Vermont	10	46,344	2,372,420
Delaware	8	48,276	2,359,162
Ohio	4	13,000	1,764,000
Indiana	4	22,988	3,261,340
Total	694	9,057,543	509,009,613

Southern States.

Georgia	47	131,34)	23,299,308
Tennessee	40	55,384	6,701,718
North Carolina	31	54,500	6,694,641
South Carolina	18	70,282	9,671,028
Alabama	14	58,480	6,756,170
Mississippi	9	18,256	1,990,800
Virginia	9	54,624	5,560,835
Kentucky	3	9,514	2,420,362
Louisiana	3	2,260	713,033
Missouri	3	19,700	2,810,485
Texas	2	5,700	982,365
Arkansas	2	1,781	132,400
Total	181	481,821	67,733,140

WORK AND WAGES IN ANCIENT GLASGOW.

THE records from which the following notes are gathered date from the year 1573 to 1627, at which period the majority of the citizens resided in the neighbourhood of the cathedral and around the precincts of the bishop's palace, now covered by the Royal Infirmary. The Drygate was the chief-street, and the Rotten-row of ancient Glasgow, like that of present-day London, was the promenade of nobility. In the middle of the sixteenth century the population of the city did not exceed 2,000, the male portion being principally made up of ecclesiastics, salmon merchants (Sir Walter Raleigh was as yet unknown on the banks of the Clyde), fishermen, and a ew tradesmen and mechanics. Except in a few instances it is impossible to get at the exact amounts paid for wages and work done. The accounts are sometimes terribly mixed. For example: "To Matthew Ker,"—Matthew was the keeper of the Tolbooth, *i.e.*, the court-house, council-chamber, and jail, rolled into one,—"for winter candill and for the mennis suppers that war execut, 25 shillings and eight pence." In this instance the calculation of the price of candles is rendered impossible by the grim "sundries" in the shape of a last meal to the condemned. When the town began to spread to the low lands on the river side, causeway-laying became a necessity. The town possessed quarries in its immediate neighbourhood. The quarriers were paid by the "output." "To the quarriers for quarrying of four hundred cart-loads of whinstone to the calsay, 9 pounds, 6s. 8d. Scots." Causeway-maker Glasgow had not, but it borrowed one, a Walter Brown, lent by the provost and magistrates of Dundee. Walter comes, makes a survey of the job, and departs. October 28, 1577, "To Valtir Brown, calsay maker, for his expenssis in cuming fra Dundey and ganging thereto again when he was feit [paid] 40 shillings." Among the items of the

causeway-laying accounts are, "Given at the Maister of Works command to Mathow Millar and John Brokes for leading of threescoir cartis [cartfuls] of stanes to the calsay from the twelt of November to the sixteenth thairof, 30 shillings." "To John Houston for 1 week's labour at the calsaye, 20 shillings." In the following month this same John Houston receives "for the making of ane [one] rude and ane half of calsaye above the Grayefriers, 3 pounds Scots." "Item, for Danskyn iron to be ane calsay hammer, 27 shillings." Two kinds of iron are frequently referred to, Spanish and Danish iron, the latter being used for fine work. Bars and stanchells are wanted by the master of work, who, whoever he might be for the time, seems to have been vested with the authority of a whole Board of Works. At his order 41 stone 14 lb. of "Spanye irne," price of the stone, 12s., and 3 stone of "Danskyn" iron, price of the stone 15s., are "furneist" to the windows of the Tolbooth. The name of the civic blacksmith appears in the following entry:—"To Robert Muir for ane pair of fetters of irne [iron] 3 pounds Scots." The smithcraft was jealously looked after by the authorities. Feb. 16, 1600: "The provest, bailleis, and counsale, dischargeis" [commands] the deacon and quartermasters of the smithcraft not to visit the smithies in Bannockburn until they produce their warrant and letter of deaconhood. In Scotland in those days the wages of a smith were included in the price of the iron supplied by him.

Tolerably satisfactory information is given in connexion with the building trades. In 1597 the magistrates covenant with John Liddell, the lime-man, "that he shall deliver to all the inhabitants his lime, every boll good and sufficient without stones, for eighteen pennies the boll." The price of sand was about one penny Scots a cart-load. A mason's wage was five shillings, and that of his labourer three shillings Scots daily. Until the year 1600 the masons and wrights (carpenters) formed a united craft. On an appeal from the carpenters to the magistrates a separation took place. In the case of two individuals a strange exception is made; "The provost, &c., notwithstanding the letter of deaconhood granted to the wrights this day [May 3, 1600], has ruled that the same shall not prejudge or hurt John Frelands and John Maxwell, that presently works both mason craft and wright craft." As to carpenters' wages. A door is to be made for the Tolbooth. For a plank of oak to be one breadth to the door, three shillings Scots is disbursed. Robert Pettigrew, carpenter, receives for work upon the said door five shillings and eightpence Scots daily, the regular wage, as shown in other entries. Glass, in 1627, cost eight shillings Scots, that is eightpence of the present time, per foot. A curious contract exists between the Earl of Eglinton and George Elphinstoun, "glasin-wricht," burgess of Glasgow, dated July 12, 1577, by which the latter is bound to mend, make new, and repair all the "glassin" work in five towns named, Glasgow being one, during "all the days, years, and terms of his lifetime"; the earl furnishing glass bands "soilburdis" (frames and sills), lime, and sand, and for remuneration the glass-wright was to receive yearly two bolls meal and one stone cheese, besides his "meit" (food) on certain occasions, the use of a horse to carry his panniers of glass and lead, and,—perhaps an important item,—all the blown-down glass and lead.

Three hundred years ago Glasgow had only two town clocks, but no clockmaker: so David Kay, clockmaker in "Carraill," is sent for by the magistrates "to set up and repair" or mend the "twa knokkis," the one made by himself, and the other old "knok" mended by him as often as he is required thereto, for which he is to be paid "rationable" expenses. David Kaye received large sums of money, but no items of time or labour are given. He receives 100*l.*, Scots for the new clock, and 3*l.* 6s. 8d. for setting it up. "Carraill" lent a clockmaker to the town that has become the commercial capital of Scotland. Carraill modernised into Crail is now a small village on the Fifeshire shore, where gray cairns and green mounds tell of a palace and a priory and noble mansions which stood in their pride when Glasgow was as yet unknown.

The citizens were bound, when called upon by the magistrates, to do their "day works" in carrying out civic improvements, or, failing to do so, forfeit for each day 6s. 8d. Scots. The Dean of Guild appears to have been also city architect. Five "lynaris,"—liners, or land surveyors,—were chosen yearly, and plenty of work they seem to have had in settling disputes as to boundaries, and assisting the Dean of Guild in keeping the streets and houses in proper repair.

In November, 1577, the town purchased "the *old* bell that went through the town of *old* at the burial of the dead" for ten pounds money, and also granted the seller to be made a burgess "gratis," and made special enactments for the safe-keeping of the relic, which was called St. Mungo's Bell. Saint Mungo's Tree is frequently mentioned as a boundary mark. Can it be that that bell and that tree were the originals of those incorporated into the city arms?

TEMPERATURE OF WATER AND THE GENERAL HEALTH.*

IN a paper read last year before this Association, the author gave the results of a series of experiments, extending over a considerable period, of the temperature of town water-supplies, and referred to the influence of the temperature of town water upon public health.

In the communication referred to it was shown that the temperature of water, as delivered through the water mains to the house of the consumer, was totally independent of the temperature of the water at its source, and that the temperature of the water supply was governed, to a great extent, at all periods of the year, by the temperature of the ground at the depth at which the water mains were laid.

It was further pointed out that the influence of temperature upon water supplies had a very marked effect upon certain classes of disease, especially diarrhœa and cholera, and that it was not until the temperature of the water reached about 62 deg. that these diseases became epidemic in a district.

In order that it may be shown that it is not the effect of increase in atmospheric temperature that is instrumental in the propagation of diarrhœa and cholera, but that these diseases are governed by the changes which take place in water when its temperature is increased, it may be pointed out that in districts in which the source of water supply is not liable to increase of temperature by reason of the arrangements adopted for its distribution, summer diarrhœa does not become epidemic. For example, we will take the three years 1877, 1878, and 1879. Both the years 1877 and 1879 (especially the latter year) were years in which the temperature of town water did not reach its most dangerous temperature, but in 1878 the temperature of town water-supplies arrived at a high and dangerous degree of temperature.

The water distributed under the system of constant supply at the author's house in Croydon, when drawn direct from the mains, had, in 1878, a maximum temperature of 64·8°, and in Westminster the water supplied by the Chelsea Water Company reached a temperature of 68·4°, while water taken from a cistern in Croydon had a maximum temperature, in the same year, of 71·5. In 1879 the highest temperature of the water in the cistern at Croydon already referred to was 67°; the highest temperature of the water as delivered from the mains in Croydon in 1877 was 61·7°, and in 1879, 60·7°; whilst in Westminster the highest temperature of the water in 1879 was 64°.

The deaths from diarrhœa in Croydon in the three years 1877–9 were as follows:—

1877 = 0·48	per thousand living in the district.	
1878 = 1·00	ditto	ditto.
1879 = 0·34	ditto	ditto.

In London the deaths from diarrhœa were:—

1877 = 0·70	per thousand living in the district.	
1878 = 1·02	ditto	ditto.
1879 = 0.52	ditto	ditto.

If these death-rates are compared with the death-rates of districts in which the water is principally taken direct from wells, it will be seen that in these latter districts the death-rates are very much lower; as, for example, in the districts of Mitcham and Merton, which are partly supplied with water from artesian wells (of a uniform temperature of about 54·6°), partly by surface wells, and partly by the Lambeth Water Company. These two districts have a population at the present time of about 11,000 persons. In 1877 the death-rate from diarrhœa was ·39 per thousand; in 1878, ·47 per thousand; and in 1879, ·46 per thousand. In Beddington, which is also principally supplied from local wells, in 1877 the death-rate from diarrhœa was ·20 per thousand; in 1878, ·49 per thousand; and in 1879 there were no deaths whatever from diarrhœa.

For the three years 1877–9, in the districts of Mitcham and Merton, there were fourteen deaths from diarrhœa recorded, of which ten occurred in roads supplied with water by the Lambeth Water Company, and four in roads supplied with water from shallow and artesian wells.

In order to further show that the temperature of water has an influence on health, the author placed upon a map the whole of the deaths from diarrhœa which have occurred in Croydon during the eleven years, 1869 to 1879 inclusive. The water-supply of Croydon proper is taken from wells, the range in the temperature of the water of which has not exceeded 1·15°, its highest recently-observed temperature being 51·9° on the 19th of June, 1880, and the lowest temperature 50·75° on the 15th of December, 1878. The water, after leaving the wells at Croydon Waterworks, is pumped to a summit reservoir, from which it is distributed to the town. In order to raise the temperature of the water it is necessary for it to flow a certain distance through the distributing mains before its temperature becomes affected. It is a significant fact that in the district within a mile of the reservoir in which the water is always at its coldest temperature in summer, during the whole period of eleven years not a single death from diarrhœa has taken place in the neighbourhood of the leading mains; but the distribution of the deaths occurs in the most remote and lowest portions of the district, or those which are naturally subject to the greatest changes in the range of temperature of the water-supply.

The incidence of the deaths from diarrhœa in London and neighbourhood also shows that this disease is due to the increase in the temperature of water-supply, and not to atmospheric temperature, as in all those districts supplied from the river Thames, the water naturally gets to its highest temperature at an earlier period than it does in those districts supplied from wells, as in the Kent Water Company's district, where the temperature of the water at its source is pretty uniform throughout the year, and in which the water is naturally colder in summer at starting through the mains than is the case with the river water. An examination of the mortality tables of London shows that, while the general mortality from diarrhœa in districts supplied by the Kent Water Company and the river water companies is practically identical, the disease always first manifests itself in the district taking water from the Thames. For example, in 1878, diarrhœa may be said to have been epidemic in Lambeth, supplied by river water, in the week ending June 29th, and got to its highest pitch in the week ending July 27th, whereas in Greenwich, supplied by the Kent water, this disease did not become epidemic until the week ending July 27th, and got to its highest pitch in the week ending August 3rd, showing the incidence of this disease to be later in the Kent Water Company's district than in the district supplied from the river Thames, the reason being that, as the water of the Kent Company is colder than the Thames water, naturally it requires the ground to be raised to a higher temperature before it reaches a dangerous point, and therefore the incidence of the disease falls later in the Kent district than in the districts supplied from the river Thames. The development of the disease in these districts is also conformable to water being the cause, and not general atmospheric increase in temperature; for if the cause were due to atmospheric influences, which are general, the incidence of the disease should have fallen at the same period in each district; but as the incidence is strictly conformable to increase in temperature of the respective water-supplies, and does not conform with atmospheric causes, the inference to be drawn is that summer diarrhœa is governed by the influence of the temperature of our water-supplies, and invariably the disease becomes epidemic when the water, whatever be its source of supply, reaches a temperature of about 62°.

Having now shown that water may be affected for good or evil by reason of its temperature, and having shown that the earth has enormous powers of influencing the temperature of water-supplies, the author desires to point out a mode by which the temperature of

* By Mr. Baldwin Latham, C.E., read at the British Association Meeting, Swansea.

the earth may be made use of in order to give water a nearly uniform temperature throughout the year, which, if brought into general operation, the author believes will remove those dangerous conditions of town water-supplies arising from an increase of temperature in the summer time, and also, possibly, from the extreme coldness of the water in winter periods, which affect public health.

The great changes of temperature in the earth occur within a few feet of the surface. The greatest range of temperature occurs at the surface, and as we pass downwards from the surface to a depth of from 30 ft. to 35 ft., the temperature becomes nearly uniform throughout the year, and at the point of uniform temperature the temperature is equal to the average yearly temperature of the place where the observations are made.

From a number of observations made by the author at depths varying from 6 in. to 50 ft., it is shown that at a depth of 20 ft. the coldest temperature is experienced in the middle of May, and the warmest temperature at this depth at the end of October. The range in temperature observed at this depth is 5° in Croydon. At 25 ft. in depth the coldest period occurs at the beginning of July, and the warmest period in the winter, the range in temperature being a little over 1°. At a depth of 30 ft. the coldest temperature occurs in July. If an apparatus similar to that which has been invented and patented by Professor J. T. Way and the author is used for tempering the water, and which consists simply of a vertical tube driven or screwed into the ground to a depth of about 25 ft. and the water or other liquid to be tempered is admitted at the top and withdrawn at the bottom of the tube, special arrangements being adopted for the protection of the ascending pipe, the range of temperature in the water required for dietic purposes need not exceed 3° throughout the year when drawn from a 3 in. tube at a rate not exceeding one gallon every half-hour. The range of temperature observed in cistern water at Croydon has been 38·7°, or on the 22nd of July, 1878, it was 71·5°, and on the 20th of January, 1880, it was 32·8°. The town water-supply of Croydon (drawn direct from the mains), the temperature of which has been shown to be nearly uniform at its source in the wells when distributed by a system of constant service, was shown to be 64·8° on the 22nd of July, 1878, and 37·2° on the 28th of January, 1880, giving a range of 27·6°.

In the tempering tube, when the conditions of the water-supply are at the worst, the underground temperature is favourable for modifying these dangerous conditions. The cold of winter only descends to the greater depths in the heat of summer, and the warmth of summer only descends to the greater depths in the winter-time, so that the temperature of the cold water of winter is raised by the previous summer's heat, whilst the warm water of summer is cooled by the previous winter's cold temperature.

Experiments made at the author's house in July, 1880, show that if ten gallons of water are drawn at any time within half an hour, the following results are obtained:—

1st gallon. Temperature of water going into tube, 68° 4′; and the temperature of the water coming out was 50° 4′.
2nd gall. Temperature was reduced from 68° 2′ to 50° 8′.
3rd gall. Temperature was reduced from 68° 2′ to 51° 7′.
4th gall. Temperature was reduced from 68° 0′ to 52° 4′.
5th gall. Temperature was reduced from 68° 0′ to 53° 3′.
6th gall. Temperature was reduced from 68° 0′ to 54° 2′.
7th gall. Temperature was reduced from 68° 0′ to 55° 0′.
8th gall. Temperature was reduced from 68° 0′ to 55° 8′.
9th gall. Temperature was reduced from 68° 0′ to 56° 4′.
10th gall. Temperature was reduced from 67° 9′ to 57° 2′.

These experiments have been repeated several times, and give precisely identical results. In the winter the water is raised in temperature; as, for example, on the 3rd of February, 1880, water going into the tube had a temperature of 34° 8′, and coming out a temperature of 49° 2′.

The advantage of the use of this apparatus consists in the fact that it is entirely self-acting, and the whole of the water supply necessary for dietetic purposes may be filtered, purified, and tempered without any greater cost than now incurred, after the first cost of the apparatus, and without adding anything of a deleterious character to the water, as may be the case when ice is used, which has been shown, especially in America, to be a prolific cause of disease when collected from impure sources. Moreover, the results secured by the tube are more than equal to those attained by the most bountiful use of ice, and further, it is delightful if, by the use of ice in water already subject to influences that are deleterious to health, the time allowed before the water is consumed is sufficient to destroy the noxious properties. In the case of the patent tube, however, a mass of water is gradually undergoing the process of tempering in a perfectly natural way until it arrives at a temperature which is shown by experience to be most healthful.

THE ANTIQUITIES OF THE PYRENEES.

AMONG the papers read at Swansea before the British Association was one by Dr. Phené, "On the Retention of ancient and prehistoric Customs in the Pyrenees." We print a portion of it bearing on statements already made by the writer in our pages:—

It would be too long an occupation of the time of the section to enumerate all the objects, evidently of ancient Celtic arrangement or construction, the quaint churches of the Templars, and the various customs found in these valleys, but on the crests and sides of the mountains, on both sides of the Pyrenees, *i.e.*, in Spain and France, are found sepulchral arrangements of stones, somewhat different to any distinctly recorded amongst our antiquities. These consist of a number of circles adjoining each other, in the centre of each is a cist with an urn, having burned bones, and the form of the circles is that of a wavy or serpentine cross.

Mons. Gourdon gives a drawing of one on the Spanish side, and I have found several on the French side of the Pyrenees.

The quaint old customs of early Celtic life are kept up all along the Pyrenees, but not in the towns in the plains or champagne country,—one of those which I described last year as still existing in Brittany, that of a wooden tally, in lieu of a bill or account, on which the baker marks by notches the number of loaves he supplies, and which attracted the attention of the President of the section last year, is also existent in the Pyrenees. I purchased the baker's bill, now exhibited, at Perpignan a few months ago, and though not so rustic as that of Brittany, it approaches more to our old Exchequer tally, and to the Welsh stick of writing, described in "Bardas," as well as to some elaborate and really wonderful calendars, still to be seen in the Cheetham Museum at Manchester, than to the rustic tally of Brittany. On crossing into Spain and prosecuting inquiries, I found the serpent or dragon emblem everywhere prominent, and even learned that the Tarasque, the ceremony of which is performed at Tarascon, in Provence, of which I gave a detailed account last year in the *Builder*, was a well-known dragon with the Spanish people, and on my explaining that I was making a study of the subject, I was told that though used as a popular diversion at fêtes, it had always a religious meaning, and that an old and well-known Spanish proverb ran thus:—

"No hay funcion sin Tarasque."
"No religious solemnity without the dragon."

The prevalence of this custom in Spain, and the crowded and multitudinous emblems, of this nature, indicate some strong pre-existing national feeling or worship, and perhaps explain a very extraordinary ceremony that takes place annually on the French side of the Pyrenees when on the eve of St. John, the whole Pyrenees being alive with the fires handed down from time immemorial as a custom, a vast pine split into many vertical clefts, is raised at Luchon, and along the route I have described in the most secluded valleys, quite up to the Spanish frontier, as at the Valley du Lys, the pine has a cross of flowers on its summit, and being filled with combustible matter, burns in a brilliant column of fire. The torch is applied by the principal ecclesiastic, after a procession from the church-door, amid the chanting of a litany.

But at Luchon, in particular, living serpents are consumed in the flames. The priest, while he applies the torch, turns his face towards Spain and the Maladetta, or mountain of bad omen. The youths of the village have miniature cloven pines which they burn. I procured one with some little difficulty, which I produce; these they brandish while flaming, in serpentine curves, and cry loudly, "hilla-hilla" (dead),—pronounced "ella." Here we have apparently a corruption of the old classic cry of the Bacchanals, who, when lamenting the death of Bacchus, holding serpents in their hands, rushed about wildly crying "Eva, eva." These ceremonies are often prolonged into the night, and the wild cries are heard echoed from mountain to mountain. M. Sacaze states that this cry is an invocation of the Sun God; be that as it may, it is the cry of the ancient Bacchanals, and is here accompanied, sometimes with real serpents, sometimes with simulated serpents of fire.

The split pine was this year raised in my presence, on the back of the principal serpent mound in the valley I have mentioned, amidst the clanging of bells during a service on Sunday. If there had been no other satisfaction to me in this, the evidence that this mound was artificially constructed, and not a natural formation, as shown by the cutting made into it, would have been great. The place where these cries are mostly practised has most remarkable sculptures of serpents, which I had photographed, and now produce.

After the burning of the pine a rush is made by the more powerful, and the burning embers are carried off in their hands regardless of pain. Pieces are then distributed to every household, and kept religiously during the year, as was the custom with the ancient Britons.

SIR JOSIAH MASON'S SCIENCE COLLEGE AT BIRMINGHAM.

THE Gothic buildings erected by Sir Josiah Mason's trustees as a science college for Birmingham and the district, are now very nearly complete in all their internal arrangements, and the institution is to be opened on the 1st of October, with an introductory address by Professor Huxley, the winter term commencing on Monday, the 4th of October. The buildings have a frontage of nearly 150 ft. to Edmund-street, just in the rear of the Town-hall and the site upon which the Free Library is being rebuilt. The front is built of red brick, with Portland stone details. The elevation, which is divided into four parts, rises in the centre to a considerable height, the walls of the upper floor receding sufficiently to allow of a passage guarded by a pierced parapet. On the ground floor in the centre is the large entrance gateway, and on each side, a pair of windows lighting the janitors' rooms and clerks' offices. There is a projecting stone balcony over this gateway, and on the next floor are the six large and lofty pointed windows, which will light the chemical lecture-room. From this floor rises a large bay window, resting on a series of corbels, and above it, dividing the attic story, a small gable, terminating with a turreted niche, the point of which is 122 ft. above the level of the street. Portions recede from the predominant central block, at the extremities of each of which are projecting wings terminating in lofty turreted gables. These projecting wings reach a height of 90 ft., and have three windows grouped together on each floor. The intermediate portions between the gables and central block are lower, being about 55 ft. in height. About 2,400 square yards are occupied by the present building, but when the original plans are fully executed, the edifice will occupy nearly double that area, the extension being made in the rear. At right angles to the block fronting Edmund-street three parallel blocks recede upon the sides of two open courts, and are joined at the south-west by a wing parallel to the front block. The buildings are therefore arranged almost in the shape of a double parallelogram, the central block, which extends from Edmund-street towards Great Charles-street, forming one of the sides for each. The ground floor is entered from Edmund-street by a large and lofty gateway with deeply-recessed shafted jambs and moulded arch, and the main corridor, in which the visitor finds himself, will be eventually continued into Great Charles-street in the rear. The groined arches and moulded ribs rest on dwarf columns, carved capitals and spandrels, and geometrical tracery. The landing on the ground floor, which is reached from this point by ascending a broad flight of steps, is 6 ft. above the level of the street, and from it runs the wide central corridor, another corridor extending in a transverse direction along the Edmund-street frontage, having at each end a staircase leading from the basement to the top of the building. Further down the central corridor, the main staircase is situated, opening to the right, with an arcade of four arches on granite columns, and communicating with every story. Beyond this, the corridor passes into the back range of buildings,

the doors on one side opening to a library and reading-room, and on the other to the physical laboratory. The first floor contains the chemical lecture-room, three other large lecture-rooms, chemical preparation-rooms, professor's apartments, class-room for magnetism, rooms for chemical collections, models, and apparatus, the lecture-rooms being exceedingly handsome and commodious. In the south-west block at the back are several large rooms for drawing. The floors above are entirely devoted to chemistry. In the front block a spacious apartment is set aside as the professor's laboratory, and there are also rooms for the study of organic chemistry, and for gas, water, and spectrum analysis. A large room, formed principally in the roof of the central front block, will be used as a museum for collections of specimens in connexion with the chemical department. There are, in addition to those already mentioned, about twenty-four smaller rooms for professors' assistants, classes, &c., and on each floor opposite the principal staircase are the necessary class-rooms and lavatories. The college contains in all nearly a hundred rooms. The several laboratories will be plentifully fitted with small and large evaporation niches for the removal of injurious vapours and gases, and with the fittings necessary for the various studies.

PROTECTION OF BUILDINGS FROM LIGHTNING.

MR. RICHARD ANDERSON read a paper at Swansea "On the necessity for a Regular Inspection of Lightning Conductors," which demands attention. The closing passages of it will sufficiently explain and emphasise his object:—It is evident that it is not sufficient merely that rods of copper should be attached to a building, but it is necessary that once put up they should be regularly inspected to see if they are in good order, so as to be really efficacious. That this is rarely done is one of the main reasons why accidents by lightning occur in places nominally protected by conductors. It is, perhaps, not too much to assert that at present not one in a thousand of our public buildings in England is regularly tested.

There can be no manner of doubt that in the matter of lightning conductors they manage things better on the other side of the Channel than with us. The French Government are in the constant habit of consulting the most eminent scientific men on the subject of protecting public buildings against the destructive influence of lightning. There is scarcely an instance in which a British Government ever did such a thing. It is true the Houses of Parliament had lightning conductors erected upon them at a very great cost and under scientific advice. But all who understand the subject practically agree in saying that it is very doubtful whether the magnificent pile of buildings in which our legislators assemble is really, that is efficiently, protected. At all events, I understand the earths have never been tested since the conductors were erected in 1852. That the Victoria Tower should have been struck in June, 1868, and slightly damaged, tends to show that the conductors at that time were not in an efficient state.

From the examination I have made, I am pretty correct in stating that one-half of our cathedrals and three-fourths of our churches have not even nominal protection. For all that science has done, the Queen might any day be killed in her apartments in Windsor Castle, the Prince of Wales in Marlborough House, and the Prime Minister in Downing-street. To see the difference between England and France in this respect, one has but to cross the Channel between Dover and Calais. At Dover, there are huge barracks of great length, on the top of high hills, exposed to the full fury of storms sweeping across the Channel, and the few conductors to be found upon them at long intervals are certainly not numerous enough for efficient protection against lightning, and their efficiency has never, so far as I can learn, been tested. The contrast in this respect on crossing the Channel is of the most striking. At Calais, the Hôtel de Ville, in the Grand Place, literally bristles with lightning-conductors, and so all the churches and chief buildings in the town. The same all over France, Germany, and Belgium. Without slavishly imitating our scientific neighbours, we might yet bestow some of the care they do upon the protection of our property as well as our lives against the terrible effects of the electric force.

NEW WESLEYAN SCHOOLS, TOTTENHAM.

THESE schools are built on a fine open site in the rear of the chapel, having frontages on each side for light, and therefore the architect had ample scope for planning them. They are on the American system, and faced with Kentish rag stone and Bath dressings, with all the class-rooms opening into a large central room. This room has an open-timbered roof and is lighted by windows at each end high up in the gables, and by dormers at the side. On each side of the platform are rooms for select classes, with separate entrances to them. The four class-rooms in front of the platform are for single classes, and each has a window and a fireplace. An infants' room, with separate entrance, is provided, and divided by the library from the school proper. A secretary's room, kitchen, with serving-hatch to the school, and heating chamber are also provided. Offices for the children are carefully arranged with distinct entrances. The school will accommodate 500 children, and seems to be very complete. The warming is by Grundy's hot-air system. The architect is Mr. Charles Bell, of Dashwood House, New Broad-street; and the builder, Mr. Humphrey, of Tottenham. The total cost, including furnishing, will be nearly 3,000*l*.

NEW (R.C.) PRESBYTERY, ORMSKIRK.

THIS presbytery, now in course of erection for the Rev. J. A. Hickey, O.S.B., is being built with the local red bricks. The cills of windows and weatherings to chimney and cap are the only portions of the building which are of stone. The roofs will be covered with green slates, as also the roof of the corridor which leads from the house to the sacristy. Most of the internal fittings will be of pitch-pine. It is being erected from the design, and under the superintendence, of Messrs. Pugin, architects, Westminster. The total cost will be about 1,522*l*. Messrs. Thomas Riding & Son, of Ormskirk, are the contractors.

RE-ARRANGEMENT OF EXETER HALL.

THE two plans we publish will serve to show the chief alterations proposed to be made for the Young Men's Christian Association, under the scheme proposed by Mr. Alfred R. Pite, and which has been determined on. The prominent features of the scheme are,—1. The utilisation of the entire basement. 2. Ground-floor alterations, appropriating the whole area for the Association work: this would comprise spacious reading-room and reference library, with arched recesses for readers, and glazed screens to corridor, convenient coffee-rooms with domestic offices, and arrangements for the enlargement of the lower hall. 3. The mezzanine floor still reserved in its entirety for offices, calculated to secure a valuable rental, or available at any time for class-rooms. 4. The re-arrangement of the large hall, to secure increased accommodation and facility of egress and access, for which latter two spacious staircases are provided, with lavatories accessible for festival occasions. In the *basement* there will be a double gymnasium on the north-side, 28 ft. in height, with access direct to new staircase to Exeter-street and ground-floor; a lecture-room on the south side, capable of accommodating 200 persons, and suitable for tea-meetings, being adjacent to class-rooms, and accessible immediately by new staircase from the front lobby of the Strand entrance, and spacious night-schools, capable of accommodating 300, having also accessory class-rooms.

The *ground-floor*, of which plan is given, presents the largest aspect of alterations to the building, as the whole of the existing offices would be utilised for Association work. On entering the main corridor, by grand staircase, will be found an improved entrance vestibule. A margin of new Portland stone paving will be laid throughout, with a central footway of bright coloured tiles and borders up to the main stairs, which will be cased with Hawksley's patent, the landings being lined with ornamental tiles. Turning from corridor eastward, access will be gained by a staircase to the basement lavatories, and immediately opposite will be the secretary's office, from which point supervision will be exercised over all persons entering the building. On the south-east side a handsome reading-room is obtained, with arched recesses for readers, and glazed screens to corridor, communicating direct with reference-library. For special meetings, the reading-room will be capable of accommodating 250 persons. On the north side the offices are obliterated, and a spacious coffee-room obtained with arcaded recesses for tables, and glass partitions to corridor, all in direct communication with a buffet, having counter and still-room, and the doors opening at foot of main staircase for convenience of large hall. The coffee-room would provide space for a special meeting, to hold 250 persons. The kitchen is made external and placed at the north-east angle of the hall. On the south side, adjoining the secretary's office, and approached by a new corridor, "The Young Men's Parlour" is placed, having central communication direct with the lower hall.

With regard to the Lower Hall the present plan shows the whole area of the present main corridor, above and below, thrown into the hall: this allows a spacious gallery, and taking the present accommodation of the hall to be 450, the enlargement would provide for 770 persons. A second method of enlarging the hall is based on the fact that it is only on exceptional occasions that the large hall and lower hall have meetings proceeding simultaneously, in which case the carriage corridor would be, if not an essential, a great convenience, and to meet this a dado division is placed on dotted line, being the area of the present hall. By this arrangement the corridor egress would still be maintained, and the hall with enlargement provided by galleries over the corridor would accommodate 650 persons. The approach to the lower hall will be improved by an entrance of more dignified character than the present. The gallery to the lower hall will be approached by a new staircase, provided at the south-west corner, and a new lobby-entrance to the corridor.

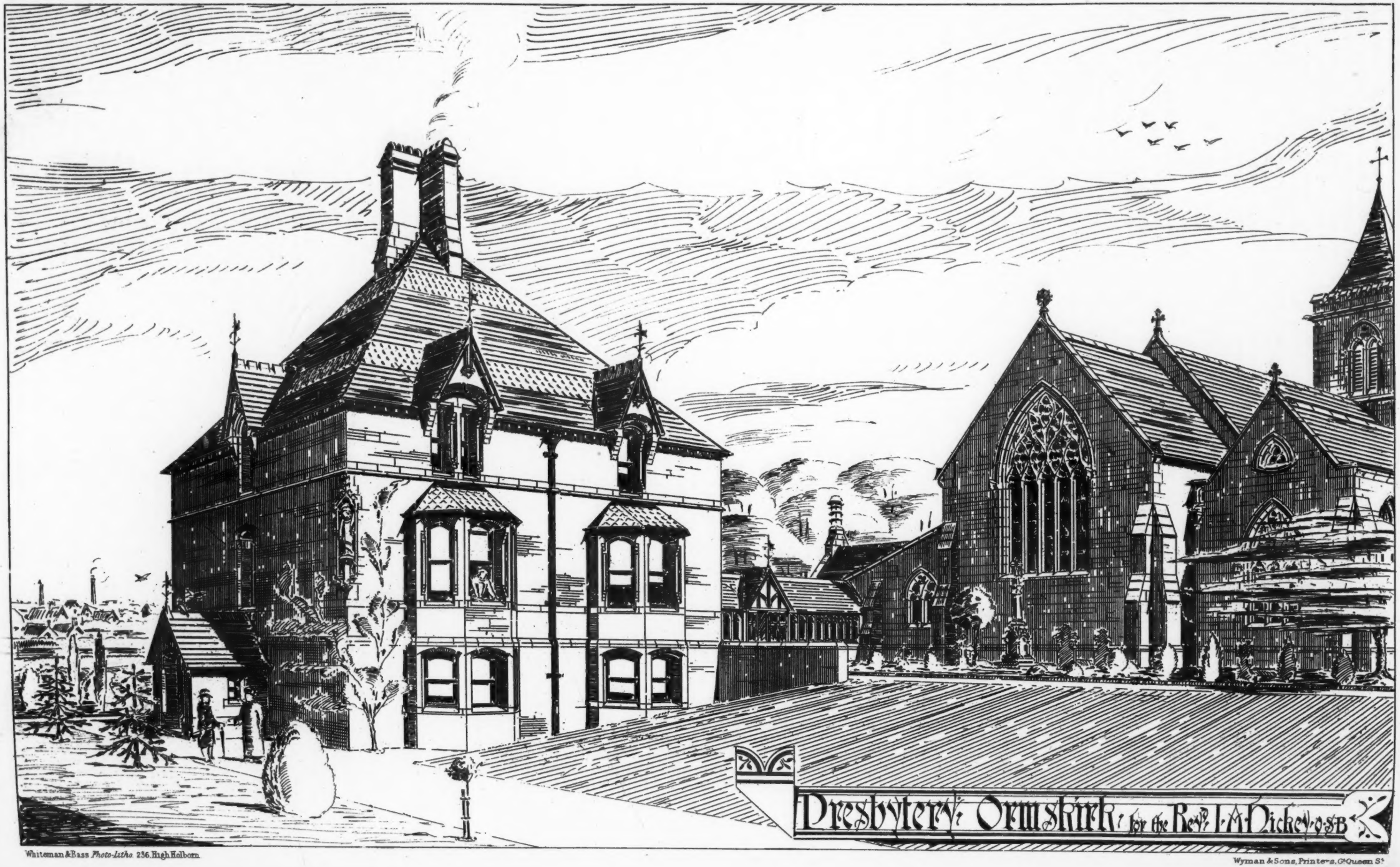
The saloon off the grand staircase remains untouched; when appropriated for meetings it will accommodate 250 persons. It is proposed to lower the present staging seats to the large hall, and place the floor on an inclined plane from its present central level, but reducing the height. Easy access and egress will be obtained by the two additional staircases. The present platform is to be re-arranged to accommodate 200 persons for public meetings and conferences, having movable seats as fitted fixtures to be placed when required on staged floors for orchestra, so that the conductor of the festival would have the platform placed in position to secure entire control of both the area and seats. Access to ladies' galleries, level with platform, with stairs to the latter are provided, from the north and south retiring-lobbies, while the existing staircases to the organ will remain. By this arrangement of platform, orchestra, and galleries, large gatherings of schools or public institutions can be held without interfering with the body of the hall, and immediate exit will be obtained by the staircases provided.

The expenditure will probably amount to 15,000*l*.

WELSH CALVINISTIC CHAPEL AND SCHOOLS, PENDLETON, MANCHESTER.

THESE buildings, which have been lately completed, were designed and carried out under the superintendence of Mr. W. Dawes, architect, Manchester. The chapel accommodates 305 on the ground-floor, and 258 in the galleries. Including the schools and chapel-keeper's house, the cost has been about 5,500*l*.

Artisans' Dwellings in Liverpool.—It has been decided by the Liverpool Health Committee to recommend the council to communicate with the Local Government Board, requesting them to approve of the erection by the council, upon the Nash Grove site, of dwellings suitable for the labouring and other classes. The site was cleared, some time ago, of low class and unhealthy property, and the engineer is of opinion that shops fronting the main streets, and improved industrial dwellings, would be the best class of buildings. The estimated cost of carrying out the scheme is 115,000*l*., the annual expenditure on the property, including interest on the original outlay, repairs, &c., is estimated at 5,377*l*., and the receipts from rents at 4,259*l*., showing an annual loss of 1,118*l*. On the other hand, the Markets Committee have recommended (as stated in the *Builder* some time ago), that the site be utilised for the erection of wholesale vegetable, fish, and poultry markets.



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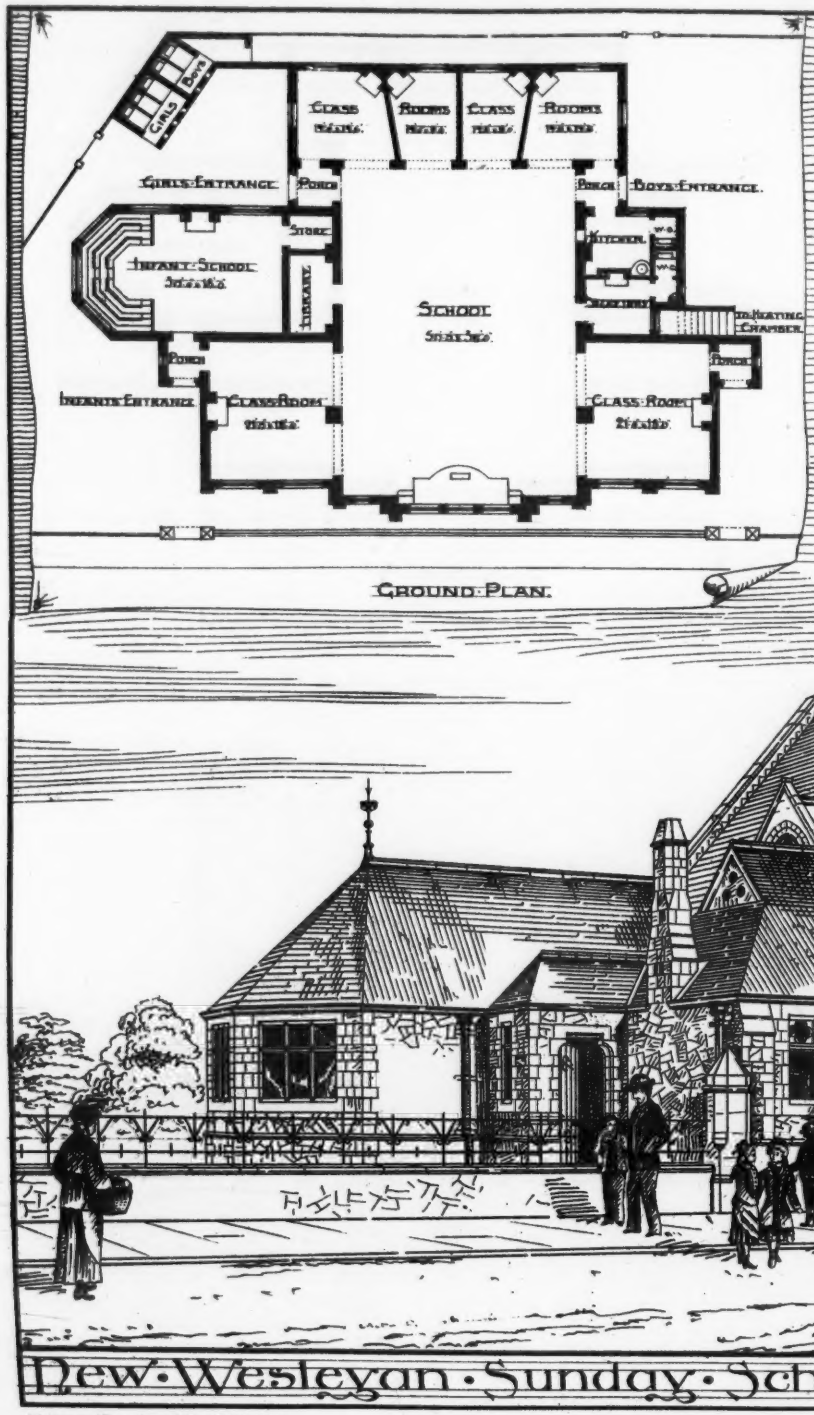
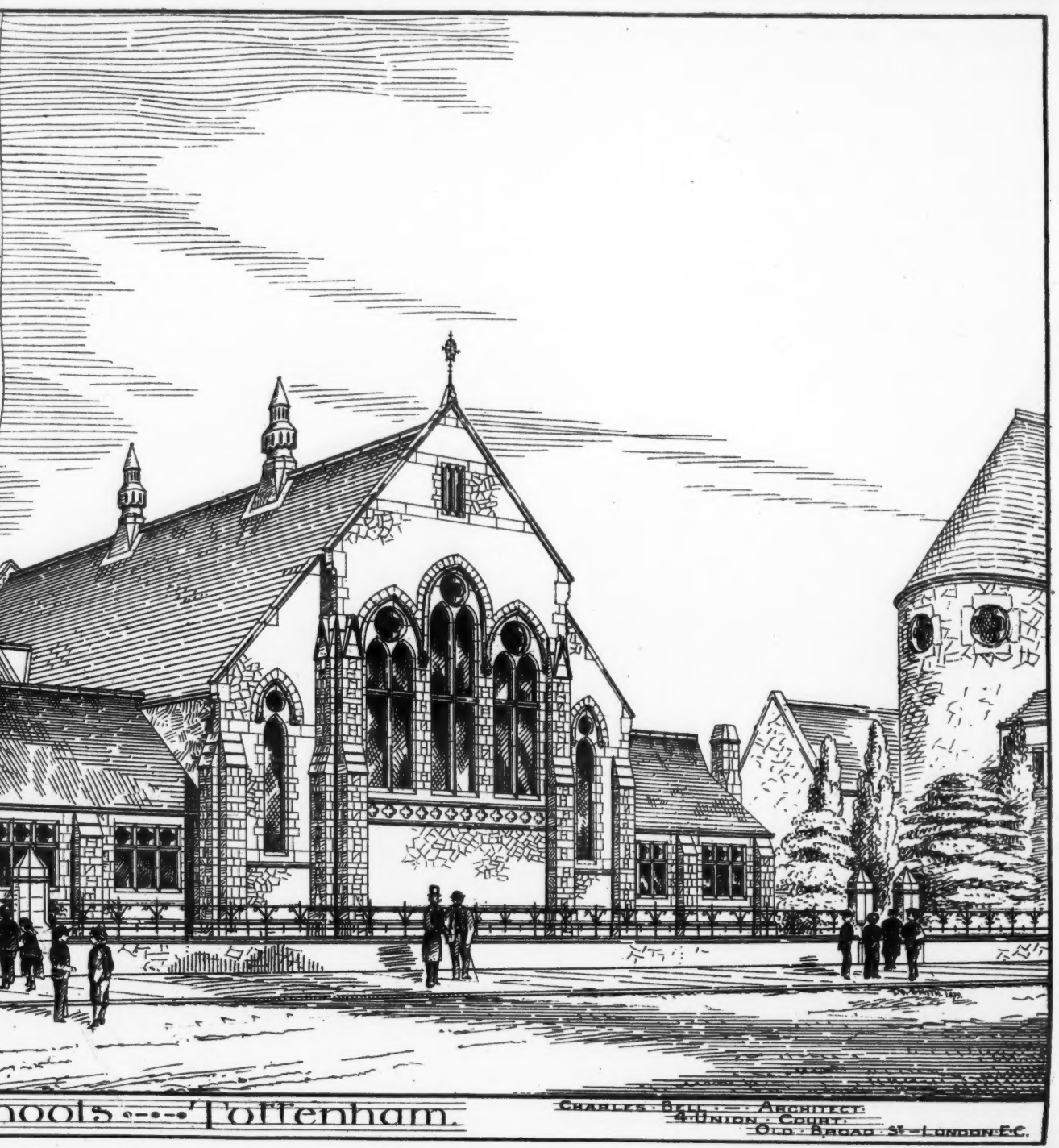


GROUND PLAN.



New Wesleyan Sunday Schools Tottenham.

CHARLES BELL ARCHITECT
4 UNION COURT
OLD BROAD ST LONDON E.C.

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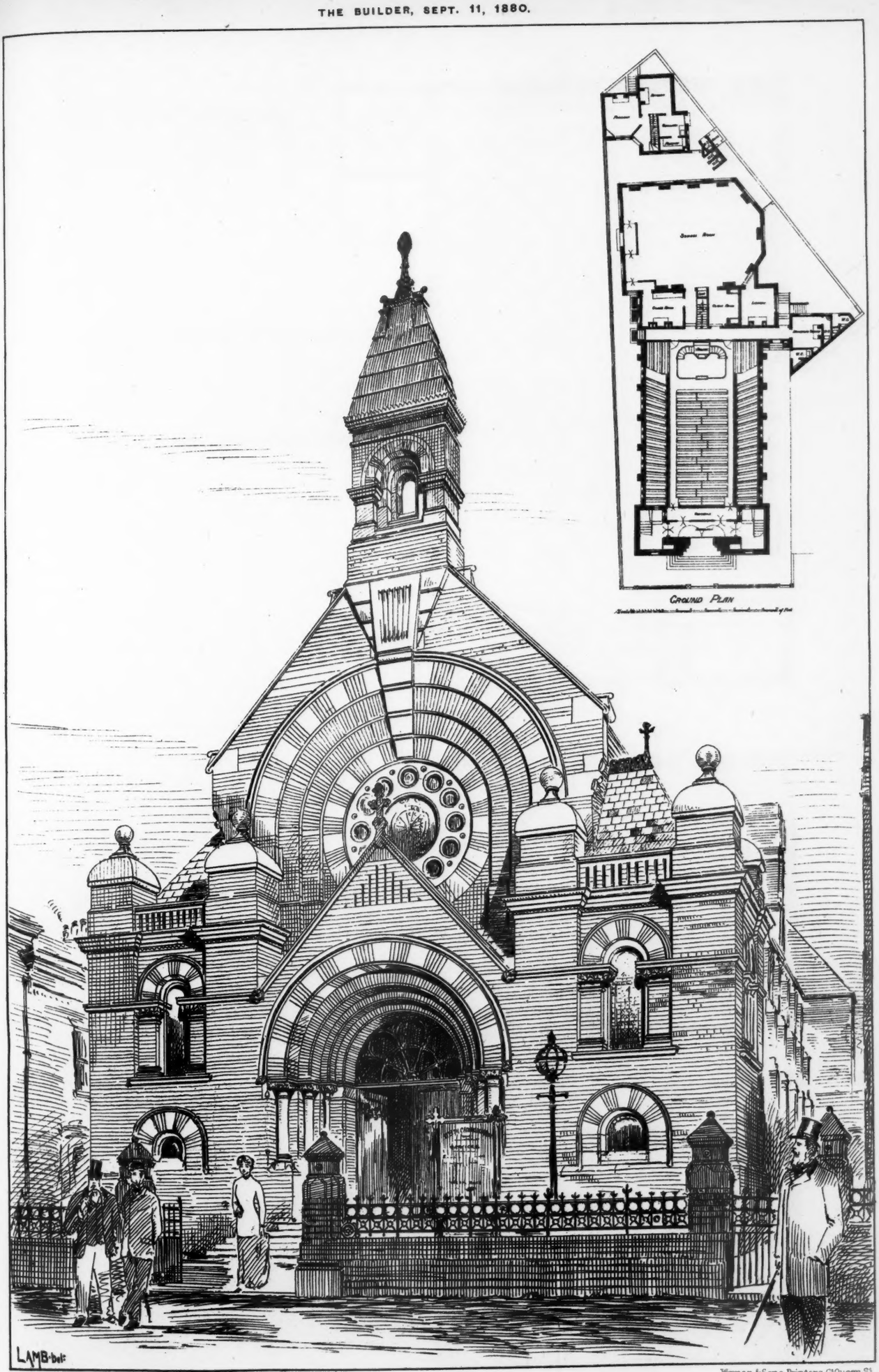
THE "HÔTEL DE VILLE," PARIS: AS RESTORED.—

ESTORED.—MESSRS. BALLU & DEPERTHES, ARCHITECTS.



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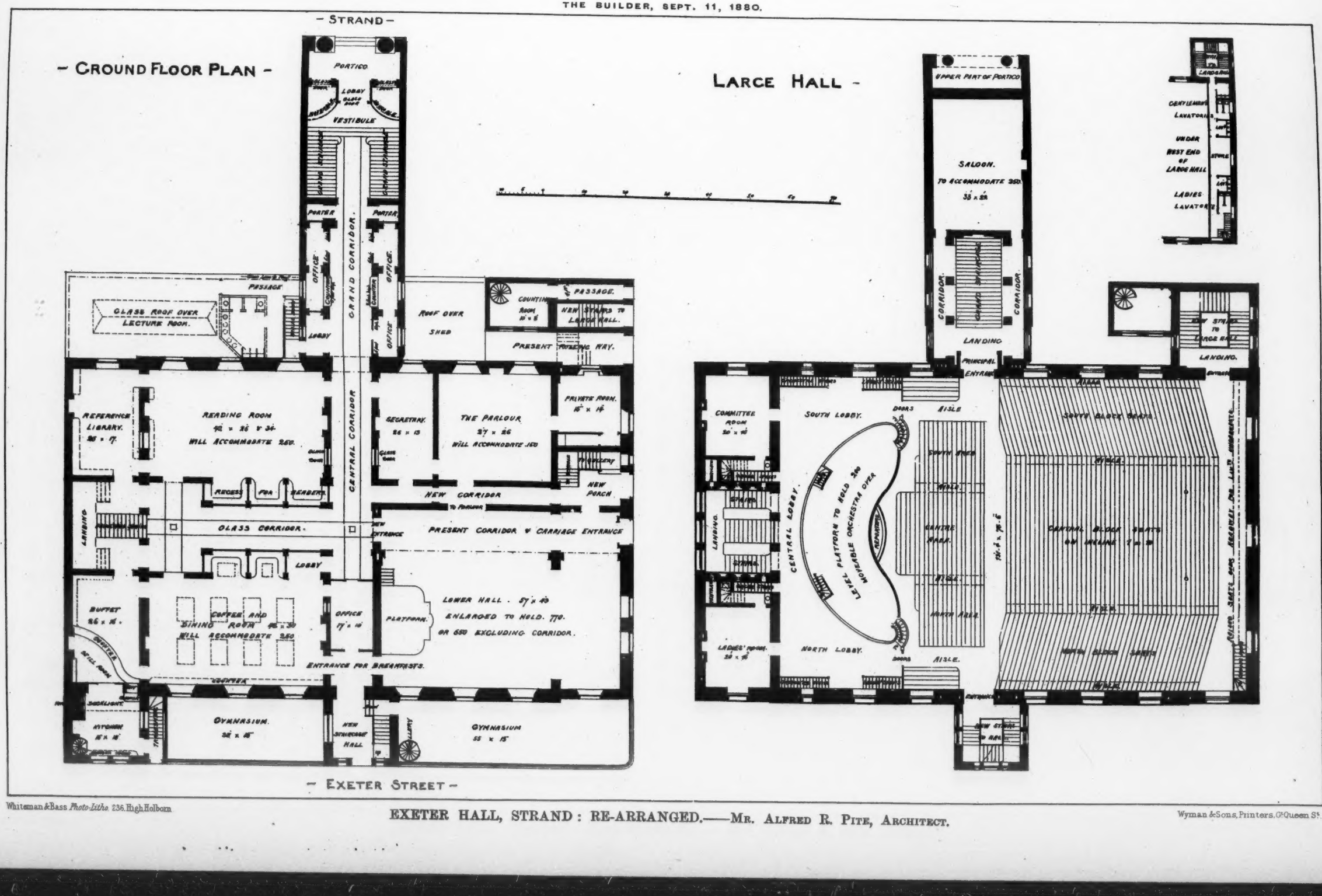
WELSH CALVINISTIC CHAPEL, PENDLETON, MANCHESTER.——Mr. William Dawes, Architect.



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EXETER HALL, STRAND: RE-ARRANGED.——MR. ALFRED R. PITE, ARCHITECT.

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THE HÔTEL DE VILLE, PARIS.

As early as the eleventh century,—at the epoch when in certain provinces the enfranchisement of the communes commenced,—as soon as a city obtained by gold the concession of a charter from his majesty the king, the inhabitants erected a municipal building surmounted by a belfry,—symbol of independence. When the town was menaced, the tocsin was sounded from the belfry, and the citizens flew to arms, and united together for the general defence.

The Hôtel de Ville of Paris, however, dates no further back than the fourteenth century. It was in 1357 that Étienne Marcel bought, at the cost of the municipality, a house styled the *Hôtel du Dauphin*, later on the "House with the Pillars," and there was held the *Parloir aux Bourgeois*. It was quite near to the Châtelet, and on the site where, later on, in the sixteenth century, the great Hôtel de Ville was destined to be built.

At the commencement, this meeting-house of the citizens consisted, says Sauval, one of the historians of Paris, of a little dwelling surmounted by two gables, and which abutted on to several other domiciles. This building, in which a number of pillars supported the first story, was bought by the Provost of the Trade Guilds for the sum of 2,800 *livres* (of Paris). It contained a state reception-room, an audience-chamber, called the *plaidoyer*, a wainscoted chapel, and a large loft for the arms.

Towards the end of the fifteenth century, notwithstanding reparations, the "House with the Pillars" threatened to fall into ruins, but they managed to preserve it until the reign of Francis I. At length, however, on the 15th of July, 1533, the first stone of a new edifice, the Hôtel de Ville, was laid with great ceremony by Pierre Viole, Provost of the Trade Guilds, assisted by four sheriffs. While the first stone was being laid, "the fifes, trumpets, tambourines, and clarions were heard; guns too,—fifty arquebuses, carried by the arquebusiers of the city, who are numerous; and the chimes rang out from the bells of St. Jean en Grève, Saint Esprit, and Saint Jacques de la Boucherie. In the middle of the Place de la Grève casks were tapped, tables laid out, bread and wine given to all comers, while the lesser folk cried with a loud voice, 'Long live the King, and Messieurs of the City.'"

The Italian Dominique Boccador, called of Cortone, had drawn out a plan of the edifice, of which the works, interrupted or suspended by the religious wars, were resumed in 1606, by an architect named Marin de la Vallée.

In the reign of Louis XIII., in 1628, this monument was completed. It consisted of a central block of buildings surrounding a quadrangular court. The central building was composed of a ground-floor and a first story. The two angle pavilions had one story more. The frontage was pierced with square or arched windows, with columns and ornaments of every description. A stone staircase placed beneath the clock led to the inner court.

It was for a long time a question as to yet further enlarging this fine building, but the project propounded during the First Empire was not put into execution until the reign of Louis Philippe.

The buildings erected from 1837 to 1844 retained the physiognomy of this historical monument, but they doubled the extent of the ancient façade, and formed an enclosure of immense extent. Mr. Godde, architect to the city, assisted by Mr. Lesueur, superintended the building. It contained rooms for the municipal assemblies, offices for the communal and departmental administrations, saloons and galleries for *fêtes*, reception-rooms, and an apartment for the Prefect of the Seine. The edifice formed a rectangle, of which the great sides presented a development of 120 mètres in length by 80 mètres in breadth. Niches with pediments between the columns, contained statues of those men who had done something illustrious for the town of Paris. On the ground-floor was the immense Salle St. Jean, where the city lotteries were drawn. All the rooms were richly decorated, and presented a magnificent *ensemble*. We well remember the admiration that was expressed by a large number of our countrymen who were entertained here by the City of Paris, after the Great Exhibition of 1851.

The important part the Hôtel de Ville has played in the history of Paris is well known to readers. And we have not space here to retrace incidents, though they are full of interest. We will only recall to mind that on the 18th of March, 1871, the Central Committee installed itself here, and in turn gave place to the Commune on the 26th of March. During the month of May the members of this Government maintained their position at the Hôtel de Ville up to the last moment; but when they were no longer protected by barricades they fled, after setting fire to this monument—essentially the "people's"—and scene of so many great deeds. All had been so well prepared for the conflagration, that there only remained of the Hôtel de Ville a few blackened ruins.

It was the palace of the citizens and of the traders of the city, and this building, which had so often opened its doors to receive a victorious people, was destroyed by the people. But the idea of raising it from its ashes could not be abandoned. In 1873 the Government invited designs in competition for the reconstruction of the Hôtel de Ville. Sixty-six projects were presented, and from these a special jury selected that of Messrs. Ballu & Deperthes. We give a view of the new building, which will now soon be completed.

The edifice is erected on the site of the old one, and is essentially the same, with a few slight modifications. A greater development is given to the façade and to the wings, which have a different disposition. But the general aspect is the same, and now Parisians will once more be able to see their Hôtel de Ville,—"The belfry-house" of the old city.

THE WORKING GILDERS OF LONDON.

A MEETING of working gilders and "preparers" in the looking-glass and picture-frame trade was held in the Lecture Theatre of the schools of St. Thomas, Charterhouse, Goswell-road, on Monday evening last, "to consider the causes of the great depression in the trade at the present time." The chair was occupied by the Rev. Stewart D. Headlam, B.A. About 150 men and youths were present.

Mr. George Ryan, at whose instance the meeting was convened, made a short statement as to the object of the gathering, saying that for the past three years the trade had been in a most depressed condition, partly caused by the very large importation of German mouldings and the extensive use in this country of "Dutch metal" instead of gold leaf. He read a letter from a tradesman at the West End showing how the public were being deceived by the employment of "Dutch metal," instead of gold, in decorative work, with the inevitable result that in a very short time the so-called "gilding" would turn quite black, and suggested that both in picture and looking-glass frames and decorative work the public might protect themselves by testing the work with aquafortis.

The Chairman having invited others present to speak as to the causes of the depression in the trade, and to offer suggestions for improving the condition of its members,

Mr. Shaw pointed out that although the use of "Dutch metal" and German mouldings had a great deal to do with the low condition of the trade, other causes had been at work, notably the use of oak, walnut, and ebonised frames, and the large demand for what were called "Oxford" frames, which were seldom gilded. He hoped and believed that when the public knew the worthlessness and want of durability of work coated with Dutch metal they would insist upon having genuine gilding.

Mr. Hamer thought that the evil was more deeply seated than some present seemed to think. The use of "Dutch metal" would, he believed, eventually do the gilders a great deal of good, for the failure of the baser material would lead the public to demand honest gilding. Unfortunately, there was foreign competition in the trade in other ways, many young Germans being at work in gilders' shops in London. In his opinion, the low condition of the trade was entirely due to its want of unity and organisation. There was no limitation in the trade as to the number of boys employed. He had been in gilders' shops in London where there were ten boys to every man employed. It had been suggested that a good strong society should be formed for the gilders of the East End of London, but that, though perhaps desirable in itself, would not increase the demand for gilders' work.

Mr. Rayment contended that the use of German metal was doing a great deal of good, inasmuch as it afforded employment for many gilders who would otherwise be doing nothing. There was a demand for very cheap picture and looking-glass frames, and so long as "Dutch metal" was sold as such, and not palmed off upon the public as gilding, there was little to complain of. As to German mouldings and "Dutch metal," it had been suggested that a protective import duty should be put upon them, but surely such a departure from Free Trade would only make matters worse by keeping out of England materials which, though very cheap, yet afforded employment to many people in the gilding trade.

Mr. Hamer said that the only good which the use of "Dutch metal" did for the gilding trade was that it turned black within a very short time. With the use of "Dutch metal," forty men could turn out as much work in a week as could be done by 100 gilders in the same time.

Mr. Williams said a lot of people in the trade grumbled about metal-gilding because they could not do it (cries of "Why, boys do it!"). It took a good mechanic to do a "metal" frame, but a "duffer" could do a gilt one. (Loud expressions of dissent.)

Mr. Mills said any child could do a "metal" frame, but it took a gilder to gild with gold. In his opinion, the great cause of the depression in the trade was the competition amongst the small master-men, known in the trade as "garret-masters," who so underbid each other in the price at which they would take work that they could not afford to pay fair wages to journeymen.

Mr. Thacker, as a small master for sixteen years, admitted that the condition of the trade was very bad. He found it impossible to earn 4s. a day for himself, even though he employed ten men. He should be better off as a journeyman.

Mr. Hamer said that one great object which the establishment of a trade society for the gilders of the East End of London might advance was the reduction of the number of hours worked by members in the trade, which were sixty per week. That should be reduced to fifty-four per week. The work would be then more evenly distributed amongst the men in the trade.

Upon this several speakers pointed out that if the men in the gilding trade worked only fifty-four hours per week they must not expect, under the present conditions, to earn as much money as when they worked for sixty hours.

A great deal of animated discussion ensued, in the course of which it was stated that the gilders of the East End of London, though forming the majority of the trade in London, were without a trade society; that the gilders of the West End had one or more societies, and would doubtless be willing to help their brethren of the East End if the latter showed a desire to unite and sink minor differences; that a former attempt to maintain a society at the East End had failed from lack of support, although the contributions were only 1d. per week; that this failure was entirely due to lack of unity caused by "jangles" between members working in different shops. One speaker attributed the depression in the trade to the use of velvet coverings for furniture in lieu of gilt surfaces,—a fashion which, amidst much laughter, he reproached High Church clergymen for introducing. Eventually, resolutions were passed appointing Messrs. Mills, Colloppy, Wyndham, Shaw, Brown, Thorpe, Williams, Wilson, Carpenter, and Richard Thacker a provisional committee (with power to add to their number) to confer together and take steps for the formation of a trade society for the gilders of the East End of London, and it was arranged that a trade meeting be held in the same place on Monday, September 20th, to consider the proposals of the committee, and, if such proposals were approved, for the enrolment of members.

The meeting terminated with brief addresses by the Chairman and Miss Edith Simcox, who referred to the influence of "fashion" on the trade, and exhorted the men to exercise forbearance and to be united for their common good.

In the course of the proceedings it was stated that whereas a book of gold-leaf, costing 1s. 3d., contained only twenty-five leaves 3¾ in. square, a book of "Dutch metal," costing only 4½d., contained no fewer than ninety-nine leaves, each 6¼ in. square. It was, therefore, urged that the public were grossly swindled when they paid for gold and only got "Dutch metal." A show of hands called for during the meeting revealed the fact that nearly one-third of those present were out of work.

SWANSEA WATERWORKS RESERVOIR.

ONE of the excursions made by the members of the British Association during the recent meeting of that body in South Wales was to the Swansea waterworks, where Mr. Edward Cousins, M. Inst. C.E., read a paper embodying some notes on the construction and repairs of the Lliw reservoir, Swansea. He said,—

The Act of Parliament giving powers to the Swansea Town Council, as the Urban Sanitary Authority, to construct reservoirs, on the Llan Lliw and Blaenant Ddu streams, and for laying conduit and mains for conveying water to Swansea, was obtained in 1860. The Town Council thereupon determined to proceed, in the first instance, with the construction of the Lliw reservoir only, and contracts were entered into, and the works commenced in the month of March, 1862. The reservoirs are constructed in valleys of denudation in the coal measures, the strata consisting of alternating beds of rock and shale. The workable seams of coal beneath the reservoir site being at a depth of about 500 ft., the surface of the valley being covered with alluvium, but only to a moderate depth. Through the whole length of these valleys there are springs of water, some permanent, but others which only flow after long-continued rain, the surface-water entering fissures in the exposed joints of rock, and finding an outlet at lower points. The Lliw embankment has a base line in the direction of the valley of 425 feet, with a puddle trench in or about the centre, carried at the deepest part 99 ft., the lower portion being in rock. In this rock there were thin open joints and small springs of water, and on the outer half of the embankment seat other small springs exist, all of which were drained to a common outlet into a permanent drain cut in the rocks and covered with lime concrete. The bottom of the trench was also directed to be formed with concrete so as to prevent injurious action of the small springs on the bottom of the central puddle wall. The drain from the outer part of the embankment delivered a steady flow of clean water, increased after heavy rain, but unaffected by any head of water in the reservoir. The volume of water varied from 27,360 gallons per day to 54,720 gallons, after much rain. This water went to provide compensation. The contingency of springs of water in puddle trenches and beneath the outer portions of embankments is common to most reservoir embankments of considerable size, and these are usually provided for in some such way by drains as here indicated. There are, of course, springs of water within the puddle wall, that is, over the area covered by the inner half of the embankment as also that area covered by the impounded water. The Lliw Embankment was completed and the reservoir filled to overflowing in October, 1867, impounding about 300,000,000 gallons of water, the depth from the ull water-line to the surface of the ground being 66 ft., and to the bottom of the puddle-trench 94 ft. The reservoir continued in work, and apparently water-tight up to February, 1873. In the spring of 1873, violent and heavy storms of rain occurred, and apparently water found its way by seams and fissures to the bottom of the puddle-trench, and ultimately to set up a small flow of water from the reservoir through the leak thus formed. That some action must have caused such leak was shown by the outflow of water from the embankment drain becoming turbid. When, by examination and continued observation, it was made evident that a leak had been sprung, the head of water within the reservoir was reduced, the action of the drain carefully watched, and the results duly recorded. It was noted that the action was intermittent; that is, the leak varied in turbidity from time to time, and the volume escaping increased as the head of water in the reservoir increased. About January, 1874, it was noted that visible subsidence in the embankment had commenced, when extra care was taken to reduce the head of water in the reservoir, and to watch the flow from the drain. It became evident that the leak was not likely to stop, and as water was necessary for Swansea, the Blaenant Ddu reservoir was commenced, and when completed, tested, and found to be sound; means were then at once ordered to be adopted to restore the Lliw to its original state. This work was commenced in June, 1879, and will be completed about the end of October next. The method adopted in repairing the embankment was as follows:—An open cutting was made transversely through the embankment 160 ft. wide at the top, and 50 ft. wide at the bottom, to a depth of 36 ft. below the top of the embankment. A trench 30 ft. long and 20 ft. wide was then sunk from the bottom of this cutting through the puddle wall to the rock, a depth of 70 ft., or a total depth of 106 ft. from the top of the embankment. In sinking this trench, indications were soon observed that the puddle wall was fractured. The fractures as at first discovered were small and branching, and were filled with sand formed by the washing of the selected material from the inside slope of the embankment. At a depth of 24 ft. in the trench, the puddle wall was found completely punched through, and this fissure (which was about 2 ft. wide) was filled up with the coarser parts of the selected material of the embankment. This fissure extended down to the face of the rock where a spring was discovered that had evidently, during the extraordinary rainfall in 1873, burst through the layer of concrete on the rock at the bottom of the puddle trench. The spring must then have acted directly upon the base of the clay puddle wall until it formed a passage across the bottom of the puddle-trench, thus allowing the water in the reservoir to find its way through the puddle-wall into the drains underneath the outer slope of the embankment, the outlet of which is at the base of the bank. This continual wearing and washing-away process of the clay-puddle caused it to settle down from time to time, resulting in the puddle becoming fractured, and the pressure of the water in the reservoir caused the material from the inside slope of the embankment to wash into and fill up these fractures in the clay wall. Having proved that the defect was confined well within the extent of the trench, it afterwards became necessary before commencing to refill the trench to make provision for relieving the pressure of water arising from the spring, and for this purpose the rock at the bottom of the trench was excavated to sufficient depth, and the drains were constructed over the several fissures conveying the water to one point, from which an iron pipe was laid, passing up the shaft to a height of 17 ft., and passing thence through a heading to the drains underneath the outer slope of the embankment. The brick drains and the whole area of the bottom of the shafts were then covered with a layer of Portland cement and afterwards with Portland cement concrete, which was carried up to the level of the old concrete. After this was completed, the drains and pipes were tested, when it was found that the spring water rose to a height of 17 ft. through the iron pipes, and then discharged itself into the old drains underneath the embankment without the slightest indication of any escape of water at the bottom of the shaft. The trench was then filled with fresh pugged clay puddle, and well rammed by means of hand rammers and a monkey, weighing 1¼ cwt., with a fall of about 6 ft. The new clay was put into the shaft with a very little admixture of water, in order to obviate as much as possible any subsequent settlement, and the new clay was well jagged in the face of the old clay at both ends of the trench. In sinking the trench it had to be timbered in a substantial manner, and in such a way that the timbers in refilling could be withdrawn in small sections, so as to prevent any settlement or movement in the remainder of the embankment, as had any settlement taken place in the old clay puddle during the progress of the work, it would have proved fatal to the success of the scheme. In carrying out these repairs, no indication of any settlement has shown itself at either end of the trench, and I have great confidence that the works having been so far carried on satisfactorily, will prove a success, and that the embankment will be made sound and water-tight. The embankment of the reservoir is 80 ft. in height, having a water area of 32 acres, and containing, when full, 300,000,000 gallons. Mr. Robert Rawlinson, civil engineer, was engineer to the Corporation of Swansea during the first period of the works, as for the original surveys, the obtaining of the Act, and the partial completion of the embankment, Mr. Hugh Unsworth being resident engineer up to the completion of the Lliw Embankment. Mr. Rawlinson re-entered Government service before the embankment was fully completed, but by special leave of the then Home Secretary continued to act as consulting engineer to the completion of the works. For the repairs and restoration of the Lliw reservoir I have been the acting engineer, and Mr. Rawlinson, with the sanction of the president of the Local Government Board, the consulting engineer, as it was considered desirable by the Water Company of Swansea that the engineer who designed and executed the works which had given way should be responsible for their restoration.

INDUSTRIAL EXHIBITION AT THE ALEXANDRA PALACE.

THE Industrial Exhibition opened here on Saturday, the 4th inst., and to remain open until the 30th inst., by no means deserves the prefix "Great" which has been bestowed upon it by its promoters. The exhibition, which is arranged in the large banqueting-hall in the park, contains some good things, of course,—the best of these being, as is usually the case, the products of men working in their own special crafts,—but, on the whole, it does not strike us as being equal in interest and value to the exhibition (which, as we remarked at the time, had its shortcomings) lately held at Bow; and this notwithstanding the fact that a large number of the articles exhibited in the hall of the Bow and Bromley Institute have been transferred to Muswell-hill. While, however, the present collection falls far short of what we conceive to be the *beau idéal* of an industrial exhibition, we do not desire to convey the inference that nothing is to be learnt or gained by an inspection of its contents. The intelligent mechanic will be able to pick up a little practical information here and there; but those of our industrial classes, male and female, who have profited by the teaching of our schools of art, will be rendered uncomfortable when their eyes light upon such inanities as a drawing-room chair, full-size, made of "pure sugar" in different colours, and the Berlin-wool representations of the Oxford and Cambridge Boat-race and of a train on the Great Northern Railway,—the locomotive especially being "fearfully and wonderfully made." There is a great deal of very good and useful needlework; but even a brief glance at some of the patchwork quilts is very trying to the eyes of any who have the least notion of the right use of colour. The contents of the exhibition are divided into seven sections, viz.,—Mechanical; Artistic; General; Fabrics and Fancy Work; Miscellaneous; Drawings, &c.; and Work done by School Children. Each of these sections is subdivided into separate classes of exhibits, the total number of entries being 942. It is not quite easy to see why carved work in wood should be included in Class 2 of Section I., "Mechanical"; one would have looked for it under the head of "Artistic." However, there is some very good carved work shown, together with fretwork and the productions of the lathe. In Class 8 of this section there are some excellent models of steam-engines, and in Class 9 ("Mechanical Models and Inventions") there are one or two appliances intended to be of service in aiding the work of sanitary improvement. In Class 13, Mr. William Elliott, of Cumberland-street, Caledonian-road, exhibits (No. 186) a model of sash-windows opening inwards for cleaning; we have seen the same thing, if we mistake not, somewhere else. It is questionable whether sash-windows made on this principle would be sufficiently wind and water-tight. In Section II., "Artistic," there are some good specimens (Class 5) of modelling in clay and plaster. Class 7, "Water-Colours," contains specimens of better work than Class 6, "Oil-Painting." In Class 8, "Pen and Pencil Drawings," we note that Mr. Thomas G. Mansfield, described as a "medicine case maker," exhibits three drawings copied by him from illustrations that have lately appeared in the *Builder*. In Class 11,—"Designs, Architectural, Mechanical, &c.,"—we note that one or two working carpenters and joiners exhibit designs for school and other buildings. Class 12, "Decorative Painting on Glass, China, &c.," includes some good work. In connexion with this class of work, we note that Mr. T. Cox, of Southampton-row, Russel-square, exhibits a quantity of excellent stained glass, painted tiles and plaques, terra-cotta vases, and other decorative work, a great deal of which was shown by him at the Bow Exhibition. Class 14, "Graining and Marbling," includes some very good specimens of this imitative art. In Class 16 there are one or two well-executed specimens of wrought-iron work.

The rules and regulations for the manage-

ment of the Exhibition state that persons eligible to compete for prizes "must belong to the working classes, in the usual acceptation of the term, or as defined by the judges,"—whose names do not appear in the catalogue. Medals and other prizes to the value of 200*l.* are offered by the promoters, but if, in the opinion of the adjudicators, there shall not be sufficient merit in any of the exhibits, no prize will be awarded.

ONE HUNDRED AND SIXTY NEW HOUSES IN THE AUCTION MART.

THE UPTON PARK ESTATE.

A LARGE estate at West Ham, known as the Upton Park Estate, a short distance beyond Plaistow, on the London, Tilbury, and Southend Railway, has recently been laid out for building upon, and upwards of 800 small houses have already been erected upon it, whilst others of a like description are at present in progress. Several of the tenements are semi-detached, and to a certain extent built of concrete blocks, having spacious gardens front and back, each side of the several streets or roads being planted with trees in boulevard fashion. The builders or owners of a large number of these dwellings do not appear to have been commercially successful; for, on Friday, the 3rd instant, 160 of the houses were offered for sale at the Auction Mart, Tokenhouse-yard, by order of the mortgagees, the Everton and West Derby Building Society, Liverpool, who, it was stated, have advanced upwards of 20,000*l.* upon the property. The particulars state that the property was estimated to produce 3,072*l.* per annum at present rentals, and that about three-fourths of the entire number of houses were already let, the remaining portion being in hand. They were stated to be held on leases for an unexpired term of eighty-five years, at an aggregate ground-rent of 640*l.* a year, the rates and taxes paid by the landlord, amounting to about 570*l.* per annum, showing a net annual rental of 1,962*l.* It was stated that the property would, in the first instance, be offered in one lot, and this arrangement was carried out; but as no bids were made, it was next offered in twenty-six lots, each lot containing six, seven, and eight houses each, for which the offers ranged from 600*l.* up to 1,400*l.* each, or an aggregate of about 22,000*l.*, but they were all withdrawn, the offers not being considered equal to the value of the various lots. It was stated in the room that the minimum value placed upon the property was 25,000*l.* Mr. Hosking, the Building Society's secretary at Liverpool, was present at the sale, instructing Mr. W. V. May, the auctioneer.

A "NATIONAL" COFFEE PUBLIC-HOUSE IN FLEET-STREET.

UNDER the title of the "Caxton," the National Coffee Public-house Company are about to open one of their establishments in Fleet-street. The Company have purchased the premises at the corner of Fleet-street and Bouverie-street, and are now converting them for their intended future purpose, the internal portion of the building undergoing an entire re-construction. It contains four floors, besides the basement, the whole of which is intended to be appropriated to the business of the Company. Nearly the whole of the interior partition walls forming the apartments on the several floors have been removed, admitting of the construction of spacious coffee and dining rooms on each floor, upwards of 50 ft. in depth from the Fleet-street frontage. A special feature of the establishment consists of a large and handsomely-fitted billiard-room in the rear. This apartment is about 50 ft. square. The new staircases from the ground-floor to the upper part of the building are wide and commodious. The basement, which will be appropriated as the culinary department, is being fitted up with ranges and cooking apparatus, and there are hydraulic lifts to the upper floors. The portion of the second floor at the rear of the building in Bouverie-street contains the manager's apartments. The principal entrance to the establishment is in Fleet-street, but there are also two other entrances in Bouverie-street.

The re-construction of the building has been carried out under the superintendence of Messrs. Parr & Strong, architects, of Finsbury-square; Messrs. Mark Patrick, & Son, of Westminster Bridge-road, being the contractors.

HARVESTING MACHINES.

SIR,—By the turned-down page in the pamphlet I send by this post, you will perceive that you were amongst the first to encourage me in my labours to save the harvests of the country. I have sown my thousands, done my task, but up to this present date reaped nothing but excessive toil,—possibly this will be my only "crop"; but it is a satisfaction to know that one has done something, and that men like yourself approve the "doing."

WM. A. GIBBS.

Chingford, Essex.

*** The evidence as to the value of the machines is so strong that it seems extraordinary that the company for constructing and letting them, which it was proposed to establish, has not been formed.—ED.

WHEELING THROUGH LIFE.

PAUSING on the level bit of road by the parish church, just at the foot of the bridge, sat two young men in a vehicle, on the like of which my eyes had not before rested. In the first bloom of youth, they might have been prizemen from some public school. But their courteous replies to a man senior to themselves rather gave the impression that they were Oxford freshmen. They asked some question as to an hotel, and readily replied to my inquiries as to their carriage. The morning was intensely hot, the time just about ten a.m. They had come, they said, from Sunbury (which was a distance of about sixteen miles), and had got over the ground at the rate of eight miles an hour. They did not look in any way distressed or fatigued. They were warm, but not warmer than any one might have been at the end of a mile's walk. After a little chat the vehicle noiselessly began to move. It ran backwards up the ascent of the bridge, turned round in half the width of the road, and then briskly ran up the steep pitch to the White Lion, at, I should say, nearer ten than eight miles per hour.

The vehicle was without a horse, and happily without a boiler. Was it propelled by electricity? Yes, by the electric force of the two young occupants. It was what, I suppose, would be called a quadricycle, made to carry two passengers. The pair sat side by side, between two large skeleton wheels; and one small central wheel in front, and a corresponding one behind, so arranged that the two would not touch the ground at the same moment, gave safety to the little spider-like car, and I conclude were of use in steering. The movement was given by treadles, and I observed that the two inner and the two outer legs of the drivers acted together. The facility and grace of the motion of the vehicle were admirable; nor was there any appearance of the strained and anxious look on the faces of the travellers which is characteristic of the rider on a bicycle.

It occurred to me that a more delightful vehicle for a summer excursion had been never designed. Conversation would be uninterrupted by the noise of wheels. A brisk movement through the air would be kept up with less expenditure, I should judge, of energy than that of the pedestrian, if measured by time, and of very far less if measured by distance. Of course, there may be drawbacks which do not appear at the first glance. But it seemed to me that the new vehicle was much more enjoyable than any single-horse carriage for such a purpose as a tour, and much more economicel, and, indeed, manageable, than a pair-horse phaëton, or that pride of the ancient road, a curricle.

It struck me that some thankful notice should be taken of this visible embodiment of one of the ideas of an engineer to whom the world has, perhaps, not yet rendered his due,—General Sir Arthur Cotton. It is now five or six years since Sir Arthur proposed what I think he called a compound bicycle. His idea was to have a machine something like three or four bicycles combined in one, in which two footmen should propel their master, or their master and mistress. It appeared to me that the case was one in which it was not clear that twice two made four. The wonderful freedom of the bicycle seemed to me to depend very much on the singleness of the propelling wheel. Friction between the different parts of the carriage, and twist between the wheels, which together absorb no small portion of motive power, are avoided in the bicycle. It seemed to me probable that the base of the vehicle could not be extended, and the working parts complicated, without bringing back so much of the torsion and working friction as to render propulsion very hard work. The *rencontre* of this morning served to show me that I was wrong, and that Sir Arthur Cotton was right. At all events, I feel that I may be doing good service to many a tourist by calling attention to so sociable a conveyance. "Did you see that carriage go up the hill?" I asked of one of the town-councillors whom I met by the way. "Never saw anything like it before," was the reply. "How pleasant it would be to take out one's young lady in such a carriage!" O. E.

THE ARCHITECTURAL FITNESS OF PICTURES IN ITALIAN BUILDINGS.

MY attention was first attracted to the above characteristic of Italian art when contemplating Leonardo's "Last Supper," in the refectory of the Monastery of Sta. Maria delle Grazie, at Milan.

No notion can be formed of the meaning of the architecture in this picture from the copies and engravings. To understand it one must visit the original; then it will be seen that the architecture of the painting is a continuation of the architecture of the room in which it is painted. The end wall is, as it were, painted away. The room is extended with windows, &c., of the same height and pattern, and at the end, on a dais, the table is set, and our Lord and the Twelve are partaking of the Last Supper.

How truly could the old monks understand as they sat at meat the idea the painter has brought out so finely, that they were disciples of the Lord, and eating with him.

No copy hanging in a frame can give the least notion of the feelings experienced in gazing on a scene going on in the same room with oneself: the very framing of the copy is fatal to it.

At Florence, too, in the Monastery of St. Marco, is a splendid painting of the Last Supper, to which the same remarks will apply. This is in the small refectory, and by Ghirlandajo, and is in beautiful preservation (in this respect very different from Leonardo's). In this painting one feels that the light actually falls from the windows on to the forms in the painting, and the glasses on the table acquire a wonderful lustre, without detracting from the noble forms around the table.

In Giulio Romano's work, at the Palazzo del Te, the same treatment can be seen in almost every room. Each painting is treated as though it were a fact actually going on in the room, or seen through architectural spaces, the architecture being sometimes real and sometimes painted, but always forming part of the building. This is in contrast with our ideas of pictures hanging on the wall.

The Sala dei Giganti is a bold, but in many respects a vulgar performance. Here the giants are overthrown by Zeus, and a thunderbolt has struck the room itself, the walls come down in tottering masses on the spectators' heads; the giants are all around, some crushed by the fall, others still grasping pieces of rock: the whole place is a ruin, a few bricks still remaining to prop up the doorway. Rocks have fallen through in places, under which legs and arms of giants protrade, and heads half crushed, their eyes still gazing into the sky in terror, for there is seen the almighty hand of Zeus grasping a thunderbolt which will complete the destruction. The whole room is painted into this scene, walls, ceiling, and all, so that the spectator feels that he is in the centre of the general ruin, and that the next thunderbolt will be launched at him.

All through Italy frescoes by the best masters can be seen treated in this manner. Correggio's work at Parma, Raffaelle's at the Vatican, &c. The architecture is so beautifully shaded from the real lights in the room that it is with the greatest difficulty one discovers whether it is painted or real, and it is this that helps forward the reality of the paintings, for the painted architecture is so wonderfully blended with the real that one fails to look on these scenes as paintings, but feels that he is in the presence of realities.

My observations lead me to think that the old masters designed the architecture of their pictures to fit the architecture of the building they were painting, and the light and shade were made to fall naturally from the openings in the architecture.

I think there is much of the architecture one meets with in old paintings, and which often strikes one as being out of place and incongruous, cut, as it often is, from walls or ceilings, which, if seen in the light and in the place for which it was painted, would be not only understandable, but really beautiful.

OWEN GIBBONS.

MASTER AND SCHOLAR.

SIR,—In my paper on "Mural Decoration," read at the Liverpool meeting of the Social Science Association, I laid great stress on the importance of scholarship, as scholarship existed in the best days of Italian art,—for men practically acquainted with historical painting very well know that the teaching in the public building and the studio, such as Raffaelle's scholars had, is the very best of art-teaching. In the paper referred to, however, I took care not to confound cause and effect. Italian art was not primarily developed by the institution of scholarships, but by the great and continuous demand of the Church and the wealthy for painting, sculpture, and architecture, necessitating the employment of assistants or scholars by the master. I was myself against the question being entered on the list of questions of the Art Section of the Social Science Association in its present form, for I think that form is misleading. Art questions should, in my opinion, be put in an instructive form. The system of scholarships could not be forced into existence without a prospect of employment, for young men are not likely to go in for historical painting when historical painting does not pay. Moreover, the *atelier* of a master in which there should be no opportunities for practising the higher forms of art would be destitute of those advantages which made the system, as it existed of old time, so valuable. It is the necessity of adapting art in mural decoration to the conditions imposed by its architectural setting that develops mastery in design from the figure painter to the ornamentist.

The system of master and pupil, in a sort of jog-trot fashion, has always existed in England, without its leading to a school of historical painting. Portrait and *genre* painters have frequently had scholars who have been brought up to follow the same kinds of art as themselves. But even here the extent of scholarship is in a great measure regulated by the demand for these kinds of painting. The parent and the artist student calculate the chances of employment, of earning a living, by following in the footsteps of the artists to whom the pupils are about to be articled. But the taking of pupils is by no means a general practice in this country. Some of our most popular artists have unfortunately refused to have scholars.

In direct contravention of the procedure in the great art epochs, we have adopted a system of art-schools without any reference, without any co-ordination, to a demand; and Artists' Benevolent Societies will in a few years be utterly unable to respond to a tithe of the applications which will be made upon them for pecuniary assistance. In no country has there been such a repetition of lectures upon the history of art as in this. What the *dilettanti* heads expect from these lectures, goodness alone knows,—but we do know that they are advocates for every kind of measure for promoting art which is diametrically opposed to the teaching of such history.

The people must be told again and again that the art of this country firstly depends upon their own state of culture; that English art will always be up to, if not in advance, of their understanding. That its status depends upon the quality and the quantity of their demand for it, and upon the public money being directly spent upon the employment of the artist, and not on throwing it away upon all the paraphernalia of art-schools, museums, &c. These may be all very well in their way and to a certain extent. But the modern craze for the multiplication of such establishments is absolutely pernicious.

W. CAVE THOMAS.

Four Masons Drowned.—On Monday evening, while seven masons were at work in the pit of the Great Western Company's Colliery, near Maesteg, Glamorganshire, the guide side-rope of the north shaft stage broke, and four of the seven men were thrown into the water below and drowned.

LIGHT AND AIR.

SIR,—The article in the *Builder* of August 28th "On some Points in the Law of Light and Air," reminds me that, some years ago, in reading the Bill then proposed and not yet passed for amending the "Metropolitan Buildings Act," it struck me that, taken together, the regulations seemed to imply that the law stands thus:—That, in the absence of prescriptive rights, an owner in building must depend for light and air entirely upon the area over his own ground, and over any adjoining public way; having no claim whatever in these respects to the area over the ground of an adjoining owner. The Bill contained sundry regulations as to heights of buildings, which secure to the building owner a certain amount of light and air, and prevent him from obstructing those on the opposite side.

It seemed rather a pity that the Bill did not distinctly state that an owner cannot, by infringing the implied law, establish in the course of time a right over the ground of an adjoining owner, which might inflict great hardship. A clause something like the following might perhaps answer the purpose:—"Within the limits of the metropolis, no claim for ancient light shall accrue on account of any light which was not an ancient light at the date of the passing of this Act."

The subject is worth discussing in your columns.

J. M.

MODEL ESTIMATING.

THE following is a list of tenders delivered for building a new wing and executing alterations, including all ironwork and verandah, to Thidy Villa, Underhill-road, Lordship-lane, for Mr. W. Howell. Mr. George Howell, architect. Quantities were not supplied:—

J. & S. Bowyer	£1,000 0 0
Watson & Dennett	655 0 0
Gammon	620 0 0
Edwards & Hayes	550 0 0
Cais & Beldom	530 0 0
Rice	483 0 0
Taylor	410 0 0
Hogan (accepted)	400 0 0
Buchan	380 0 0
Ayers	250 0 0

GRAINING AND MARBLING.

SIR,—Will you kindly use your powerful organ in assisting me to find out the cause of the decline in public favour of a now almost obsolete profession, viz., Graining and Marbling. It is well known to the trade that architects and the fashionable decorators have tried to stamp out graining whenever and wherever they can, so that they can introduce the system of colour-painting now so very fashionable, but a very poor substitute for art. I fear that without some assistance from you and your readers as to the actual cause of the decline of a once much-appreciated profession, there will be but little prospect of improvement. To be a good grainer requires the study of a lifetime, and in some cases great energy. I trust you will assist me in ventilating this argument.

A POOR GRAINER.

TO EVERY ONE HIS OWN.

SIR,—Some papers on quantity surveying written by me were published in one of your contemporaries in the years 1878 and 1879. Much of the matter and phraseology of the additional chapters of the third edition of Mr. Banister Fletcher's book, "Quantities," published by Mr. Batsford since my articles appeared, is identical with portions of those articles.

My papers (with additions) are shortly to be published by Messrs. Spon, and as I am anxious to guard myself against the suspicion of plagiarism, I shall be glad if you will allow me to make this statement through your paper.

JOHN LEANING.

Rowland Hill Memorial.—At the last meeting of the City Commission of Sewers, the Streets Committee brought up a report in regard to a communication from the Lord Mayor, as the chairman of the Rowland Hill Memorial Committee, asking the sanction of the Commission to the erection of a bronze statue of the late Sir Rowland Hill in the open space at the south-east corner of the Royal Exchange, facing Cornhill; the statue was about to be entrusted to a competent sculptor, and, as a work of art, would be worthy of the City of London. The committee had viewed the locality and found that the space available at the spot in question would admit of the erection of the statue without inconvenience to the public, and they recommended that, subject to their approval of the plan and models of the statue, the Court's permission to its erection at that site should be given. On Mr. Innes's motion, the committee's report was adopted.

GOOD NEWS.

THE BRISTOL VENTURERS.

SIR,—Two hundred guineas and upwards per week may be easily and safely earned by persons of either sex, without detriment to present employment, or previous knowledge of the business.

This assertion reads very like an advertisement which has haunted the daily papers for some years past, and which, from its longevity, one may suppose has worked wonders among Mr. Carlyle's "thirty millions, mostly fools." The only drawback attending this speculation (and it seems to be considered no insuperable one) is that it has been known, upon some rare occasions, to bring its enterprising projectors within reach of the proverbially strong arm of the law.

Perfectly free from any such vexatious amenity, and infinitely more lucrative, is the scheme devised by the Society of Merchant Venturers of Bristol for making capital out of the simple faith of their fellow-men,—a scheme which fully warrants the cheering announcement with which I commence my letter. The El Dorado discovered by these ingenious gentlemen is none other than the promotion of architectural competitions; and from what I can learn of the success of their first venture, they must be flattering themselves that, this time, they have indeed "struck ile."

A reference to the advertisement inserted by them in your paper, some weeks ago, will throw some light upon their exact method of procedure. It is headed "New Trades School, Bristol," and is somewhat discreetly worded; we are told that plans are required for this building, and that a premium of 100 guineas will be awarded to the author of the best design. There is no mention of the approximate cost of the work, nor are we told whether a professional referee is to be employed; the only further information we are vouchsafed is that all applications for particulars must be accompanied by one guinea. Prominent among the particulars so obtained will be found the fact that your guinea is gone from you for ever, the Society gently but firmly declining to return it under any circumstances whatever. You may further learn that they do not pledge themselves to build any Trades School at all, or if they do, to employ the architect whose design has been placed first,—the fact being that they do not bind themselves to anything beyond disgorging one hundred out of the three hundred guineas which they are likely to obtain from confiding members of our profession.

Let me pay my tribute of heartfelt admiration to the master-mind that put up this downiest of downy dodges. Artemus Ward scored one when he "hogged the public" with a waterproof tent and a pea-green cow. A certain prominent member of the Stock Exchange, not long ago, exhibited some shiny tricks, which were very admirable in their simplicity. The confidence trick and the painted sparrow are plants which reflect much credit on their respective authors. But all these must pale their ineffectual fires before this last great light, who may fairly rank beside the intellectual Colossus who first conceived the idea of deriving an income from three thimbles and a little pea.

It is pitiful to think how many signers "this merry bond" is likely to find among the younger and poorer members of our profession.

LOUIS KNAPP.

NOTES FROM EDINBURGH.

The New Medical School Buildings.—The Anatomical Department of these buildings will be ready for occupation by the students of the School of Medicine at the beginning of the winter session, early next month. The buildings are ranged round two large quadrangular courts, which serve the double purpose of promoting ventilation and increasing the facilities for lighting. The north court, measuring 127 ft. by 85 ft., lies parallel to Teviot-row. The range of buildings on the north side of this court is intended chiefly for the departments of Materia Medica and Medical Jurisprudence; and in the comparatively short period since that contract was let, Messrs. Beattie & Sons have made good progress with the work. The east end of the south court (which measures 97 ft. by 53 ft.) is occupied by the anatomy class-room, measuring 58 ft. by 42 ft. Of the range forming the south side of the south court the whole upper floor, measuring 108 feet in length by 39 ft. in width, and 27 ft. in height, is set apart as the dissecting-room, the roof being formed in ridges glazed towards the north, so as to afford as much as possible of steady light. In some of the rooms ventilating-grates have been introduced, while in nearly all extraction-shafts have been erected for the purpose of carrying away the vitiated air to the tall brick column which recently formed the subject of some discussion in Edinburgh on the score of its alleged unsightliness. The stalk in question rests on a square base 18 ft. wide, and rises to a height of about 180 ft. Near the bottom the shaft is 50 ft. 6in. in circumference, while at the top it is contracted to 17 ft. 6 in. About 150 ft. from the base there are eight ornamental openings for the outlet of the vitiated air led into the shaft. Up the centre runs a chimney, made of malleable iron boiler-plate, 2 ft. 6 in. in diameter, which will have its escape at the cone-shaped summit of the shaft, and which, by heating the air encircling it, is expected to produce an efficient draught for ventilating purposes. The contract for the southern division of the building, which is in the hands of the Brothers Meikle, of Ayr, does not expire till the 31st of August, 1881, so

that the anatomical department, with the exception of the museum, which is 112 ft. long and 40 ft. wide, and the principal entrance-hall from Park-place, has virtually been completed a year before the specified time.

The Calton Gaol.—A representation has been made to the Secretary of State by the County of Edinburgh Prison Board with reference to the claim of the Government against the county and burghs in respect of the alleged inadequacy of the Calton Jail. The Board represent that the sanitary state of the prison and the uniform health of the prisoners,—which is the best test of adequacy and fitness,—are pre-eminently good. Having pointed out that Sir Richard Cross had no hesitation in certifying that the east division was "unexceptionable," the memorial goes on to say that the west division, which was built in 1816, has been objected to on the alleged ground that "the cells are almost all of small cubic capacity, defective in ventilation and also in heating." It is stated that when rule 21 of the Rules for Prisons in Scotland was made in 1874, providing that for each prisoner there shall be not less than 800 cubic feet, the Board protested against its being applied to existing prisons, and especially to the prison of Edinburgh. The Board, therefore, express the opinion that to take down the west division would be a most unjustifiable waste of money. The number of cells in that division is 127, while in the east division and the civil prison there are 111, the total number being 238. The Board admit that the part of the prison called Bridewell, and which is used for female prisoners, is objectionable as a place of confinement,—not at all in a sanitary point of view, for they hold it is as healthy as the rest of the prison, nor because the accommodation is inadequate, but on account of its being, from its construction, unsuitable for proper discipline. The condition of the building itself is very good, the materials are valuable, and, perhaps, the Board suggest, it could be altered or even rebuilt at comparatively small expense. To this representation a reply has been received from the present Home Secretary, setting forth that, after consulting with the Lord Advocate on the subject, he finds that he cannot depart from the conditions laid down by his predecessor in office.

NEW WAREHOUSES IN SUNDERLAND.

AMONG the improvements indicated in a recent article in these columns, entitled "Progress in Sunderland," were certain new buildings in Union-street, on the west side of the Central Railway Station. These three blocks of premises are all to be applied to business purposes, and include the new warehouse of Messrs. Blacket & Son, drapers, that of Messrs. Pearman & Corder, wholesale grocers, and a new public market, which is being erected by private enterprise. The buildings are ornate in style, and of considerable dimensions. Messrs. Pearman & Corder's premises, which are now all but completed,—indeed, partially occupied by the firm,—are built mostly on the site of the old premises destroyed by fire over eighteen months ago. In commemoration of this fact, the firm has named its new warehouse "The Phœnix Buildings," and has adopted a representation of the fabled bird as a trade-mark. The new structure is erected after an Italian design. Its frontage includes a substantial tower, rising from the central pavilion roof. The tower is adorned with arches and pilasters with Corinthian capitals, and bears a dome of glass, glazed on Mr. Rendle's patent principle. In front, the building is divided into five spaces by a slight projection in the middle and at each end. The ground story is rusticated. The windows of the first floor are separated by pilasters of polished red granite, with Corinthian columns. Surmounting this is an enriched stone cornice, and extending the whole length of the façade. Above is a stone parapet supporting a French pavilion roof at either end and in the middle, the plain line of parapet opposite the principal roof-features being relieved by pedimented dormer windows executed in stone. Resting on the central pediment is a carved stone Phœnix. The stone front is continued round the corners of two side streets, about 22 ft. at each end, the counting-house being thus distinguished from the warehouse proper, which is a brick building of five stories, situated in the rear. The white freestone used in the construction of this, and for facing the adjoining building of Messrs. Blacket's, is from Denwick Quarry, near Alnwick, the property of the Duke of Northumberland. By the front entrance the counting-house is reached,—an apartment 60 ft. by 20 ft., exclusive of a retail shop, which will be let off, at either end. The interior of the counting-house is fitted up with mahogany, the floors laid with marble mosaic. But the main staircase, reached from the front entrance, is the most striking feature of the interior. It is constructed entirely of iron and glass, and rises in the tower to a height of five or six stories underneath the glass dome above mentioned. The different floors throughout the structure are composed of Portland cement concrete. In the large brick-built warehouse at the rear of Union-street, every facility has been provided for carrying on an extensive trade, the southern section being devoted to the grocery, and the northern to the provision department. Spiral staircases afford communication between the lower and upper portions of the building. In the bacon department there are complex appliances for washing and preparing the article after its arrival in huge boxes from America. With a view to maintain the required current of air, two long fans are fixed on the shaft from which the lifts are worked, which shaft runs the entire length of the building, and by the rapid revolution of the shaft the desired object will be effected. On the western side of the upper floor is a large tea-mill by R. Waygood & Co., engineers, London, workable by either steam or hand power, and capable of mixing 500 lb. of tea at a time. In a central chamber to the west, on the top floor, is an eight-horse power Otto gas-engine for working the central despatch-hoists, and two reception-hoists or lifts, as well as the tea-mixer, coffee-mill, &c. The coffee-roaster, also by Waygood & Co, is heated by a row of gas-jets, the gas being mixed with the air by means of a force-pump. When the coffee has been "done" it is dropped from the roaster into a shallow box-like apparatus, with double bottom, the one being perforated. A fan is then connected with the box, and at the rate of 4,000 revolutions per minute, the cool air is drawn through the coffee, the heat being conveyed through the wall into the street. The appliances for the delivery and despatch of goods are very complete. Telephonic communication will be established all over the building, while electric-bells will be hung in the private office of members of the firm. Mr. Frank Caws, of Sunderland, is the architect of the new building. The excavating, brickwork, and concrete flooring have been carried out by Mr. Robert Hudson, jun.; stone front and joiners' work by Messrs. John Hirst & Sons; and slating by Mr. J. E. Nelson, all of Sunderland.

GILCHRIST ENGINEERING SCHOLARSHIPS, UNIVERSITY COLLEGE.

THE regulations for prizes and scholarships at this college, just now issued, show how numerous are the opportunities there which offer themselves to young men of ability and energy. We wish, however, to call attention specially to the Gilchrist Engineering Scholarships, the gift of the Gilchrist trustees, and which are offered this year for the first time in connexion with the Engineering Department of the college. Two entrance scholarships, each of the value of 35*l.* per annum for two years, are offered for public competition, which is limited to those who have not previously been students of the college. Candidates must, on or before the 23rd of September in each year, send to the secretary written notice of their intention to compete.

Copies of these regulations, and of the prospectus of the college classes, can be had on application to the secretary of the college.

The Lincrusta-Walton Company, Limited.—Under this title a company is being formed for the purpose of acquiring and developing the English patents of Mr. Frederick Walton, of London, the inventor and patentee of linoleum, for the application of compounds of solidified oils to the manufacture of wall decorations in solid relief, and other articles specified, together with the machinery and apparatus employed in the various processes substantially as described in the said patents; also the goodwill and business connexions and the buildings and plant. The new fabric possesses qualities which for decorative and other purposes are unique. It seems to us a mistake giving up the original name.

WESTMINSTER OFFICES COMPETITION.

WE are informed that the report of the referee, Mr. Charles Barry, has this week been discussed by the committee to whom the matter was delegated, and that they have agreed upon their report, which will probably be taken into consideration at a meeting of the Vestry to be held on Tuesday, the 21st inst. In the meantime, the recommendations of the Committee will, it is understood, be kept secret.

PARLIAMENTARY JOTTINGS.

Compulsory Purchase of Land for Public Purposes.—In the House of Commons, Mr. Watkin Williams asked whether the Government would, in the recess, consider the propriety of amending the law so as to give facilities to the people to obtain land by compulsory purchase for public purposes, such as chapels, markets, and the like, by some speedier and less expensive process than by Act of Parliament. Mr. Dodson, in reply, said:—Great facilities are now given for the compulsory purchase of land for sanitary purposes, such as sewage-farms, water supply, the clearing of over-crowded areas in large towns, sites for hospitals and mortuaries, street improvements, cemeteries, &c., by means of provisional orders. Lands for markets may also be purchased by the same process, which, except where the confirming Bill is opposed in Parliament, is, as a rule, a very inexpensive process. Parliament has always reserved to itself the right of vetoing the compulsory purchase of private property, and at present there is no authority to which this power can properly be delegated. At the same time, there are cases to which the provisional order system may advantageously be extended, and I will not fail to consider the matter during the recess.

Leases Bill.—On the order of the day for going into Committee on this Bill, Mr. O. Morgan said that this was a question connected with land reform with which the Government would have to deal next year, and he hoped, therefore, the hon. member opposite would not persist in moving to go into committee.—Mr. Warton said he would not press the Bill against the wish of the Government, though he did not believe in their dealing with the question next year. The Bill was withdrawn.

City Lands (Thames Embankment) Bill.—On the motion for the second reading of this Bill (which was promoted by the Corporation of London to sanction certain arrangements with the Government as to the acquisition of a site for the proposed new Mint), an hon. member moved that the House be counted, and the House was counted out.

The Employers' Liability Bill.—The House of Commons, on the 2nd inst., considered the Lords' amendments to the Employers' Liability Bill. Most of them were agreed to, but the House disagreed with Lord Brabourne's amendment, omitting Sub-section 3 of Clause 1. On Lord Beaconsfield's new clause, limiting the Bill to the end of 1882, Mr. Dodson proposed to amend it further by substituting 1887 for 1882,—thus giving, as he explained, seven years' experience of the Bill, and throwing the onus of renewing or amending it on the next Parliament. This proposal was concurred in after a short debate, but a division was taken on Lord Beaconsfield's clause as thus amended, with the result that the House resolved to agree to it by 72 to 33.——The Bill again came before the House of Lords on the following evening, when the Lord Chancellor moved that their lordships would not insist upon their amendment omitting Sub-section 3, Clause 1.—Lord Brabourne said that after what had occurred in another place he had nothing to do but to retreat from the position he had taken up with what grace he might. It had been stated in the course of the discussion on the Bill that he had acted solely in the interest of the employers. It was true that he had moved the amendment in consequence of a resolution passed by employers of labour representing an immense amount of capital; but he would not have done so if he did not conscientiously believe that it was for the interest of the employed as well as of the employers. He believed still that it was for the best interest of the workmen to feel a community of interest with their employers. The Bill, he feared, would disturb that feeling, and plunge the workmen into litigation, so that the only persons who in the long run would benefit by it would be the lawyers. He had before stated

that he did not regard the Bill as a compromise, and that it would lead to fresh agitation, and he had only to call attention to the fact that the gentlemen who represented the Trade Unions, and had seats in the other House, had deliberately stated that when the Act expired the workmen were certain of getting an ulterior measure which would embody all their demands. He had only again to say that in taking the course he had adopted he had acted only for what he firmly believed to be the public interest. The motion was agreed to, as was also one agreeing to the Commons' amendment to the Lords' amendment extending the operation of the Bill from two to seven years. A message was agreed to be sent to the Commons accordingly, and the Royal Assent has since been given.

ART EXHIBITIONS.

Liverpool.—The private view of the Autumn Exhibition of pictures in the Walker Art Gallery took place on Saturday last. Several of the most prominent pictures from this year's Royal Academy Exhibition are on view. The exhibition promises to be one of the most attractive yet held in the city.

Kirkcaldy.—Last week the annual exhibition in connexion with the Fine Arts Association was formally opened to the public. On the present occasion space has been found in the galleries for 874 works in oil painting, water colour, and sculpture, as compared with 683 placed last year.

Birmingham.—An exhibition of paintings on china has been opened in the rooms of Mr. Thrupp, New-street.

CHURCH-BUILDING NEWS.

Aston.—The first section of the enlarged and restored parish church of Aston, Birmingham, has been formally opened. This portion consists of an extension of the nave and aisles in an eastward direction over the site of the old chancel. It was commenced rather more than a year ago, and the memorial-stone was laid by Lord Leigh on the 24th of September last year. The entire contract embraces the almost complete rebuilding of the church, with the exception of the tower, and its enlargement to nearly double its former dimensions, at a cost of about 10,000*l.* Originally the church was only capable of seating 800 persons, but when the works now in progress are completed, accommodation will be provided for an additional 500 persons. The work is being carried out under the direction and from the designs of Mr. J. A. Chatwin, architect, Birmingham. The portion of the work now completed has cost about 4,000*l.* The erection of the chancel, Erdington Chapel, and organ-chamber will next be proceeded with, and when the additional space thus obtained is secured, it is intended to restore the old portion of the nave and aisles, and to raise the clear-story to the height of the new work. The western entrance to the church will consist of a Perpendicular doorway, the arcade being in the Early English style. The inside of the church is faced with Sutton stone from the same quarry as that used in the erection of the tower and spire, and a much harder stone from Penkridge has been used for the external work. In the north aisle the altar tomb, the earliest monument of the Holte family, remains *in situ*. The monument represents William Holte, who died in 1514, and his wife Joanna. The other monuments of the Holte family have been refixed on the walls of the north aisle. In the south aisle, near their former position, have been placed the monuments of the Bagot family. The altar-tombs to the Ardens, Erdingtons, and Devereux, and other monuments formerly in the chancel, have been, we are told, "carefully packed up," and will, it is hoped, shortly be placed in their respective positions in the new chancel and Erdington Chapel. It is proposed to re-erect the pictorial window to Letitia Dearden, by Eggington, in the east end of the chancel aisle.

Frome.—St. Katherine's Church, Frome, has been re-opened. The chancel was restored about eleven years ago, and now the nave has been almost entirely rebuilt, as well as the south porch, leaving the tower to be restored at some future time. The whole of the new windows are of the Early Decorated style, and they are filled with cathedral glass of various tints. The floor of the nave and aisles is of encaustic tiles, and beneath the seats it is of blocks of wood arranged in what is known as herring-bone fashion. A new organ has also been added. The architect was Mr. J. L. Pearson, A.R.A., and the work has been executed by Messrs. F. P. & G. Brown, of Frome.

Walsall.—The memorial-stone of the south aisle of the Church of St. Michael and All Angels, Walsall, has been laid. The church is being built in sections as funds are obtained, the work commencing with the nave and chancel in 1868, and the north aisle following last year, and both being constructed by Mr. Lovatt, of Wolverhampton. The section now commenced is being carried out by Mr. Garlick, of the Saltley Works, and when it is finished there will still remain, to complete the design, the spire at the western and the organ-chamber and vestry at the eastern end. The church is in the Early English style, the materials used being Hammerwich stone for the walls and Bath stone for the dressings, with cathedral glass for the aisle and clearstory windows, and nave columns of Himley stone. Mr. J. Veall is the architect. The cost of the south aisle will be between 500*l.* and 600*l.*

Painswick.—Since the re-opening of Painswick Church, a year ago, many additional improvements have been effected. The stove, with its ugly and obtrusive appendages, has been superseded by Messrs. Haden's warming apparatus; and a stone pulpit has taken the place of the wooden structure; it is the gift of Mr. U. J. Davis, of the Court-house, and has been executed from designs by Messrs. Waller, architects, Gloucester, who superintended the restoration of the church. Before the restoration the pulpit stood on the south side of the chancel-arch; now it is placed on the north side of the same arch, in front of the curious "squint." The old east window has been pulled down, and the altar-piece, as it was termed, has been removed, and a new three-light painted window has been inserted. The subjects are,—North, our Saviour bearing the Cross; centre, the Crucifixion; south, the Entombment. This window is the gift of Mr. H. C. McCrea, father of the vicar, and is the work of Messrs. Dixon, London. A carved oak screen now divides the Chantry Chapel, which is used as the organ-chamber, from the nave. It was made by Mr. T. Guide, of Pitchcombe, who was contractor for the restoration of the church.

SCHOOL-BUILDING NEWS.

Exeter.—The new buildings of the Exeter Grammar School have been opened by the Bishop of Exeter. The new school is situated at Victoria Park. About nineteen acres of land were secured for 8,200*l.*, and the necessary buildings have been erected, except the chapel, which has yet to be built, on about two acres of this, at a cost of nearly 14,000*l.* The schools have been constructed of brick-work, with Box Ground stone dressings, by Messrs. Stephens & Bastow, of Bristol, from the designs of Mr. W. Butterfield. The style is described as "Modern Gothic." On the ground-floor of the main centre building is placed the large class-room, 30 ft. by 20 ft., and 13 ft. 3 in. in height. Adjoining are four smaller class-rooms, each 22 ft. by 20 ft., and 13 ft. high. The entrances to these apartments, which stretch along nearly the whole front of the building, are from a broad lofty corridor, on the opposite side of which are placed retiring and other rooms; on the left of this passage, entering from the front door, is situated the great dining-hall, 66 ft. by 22 ft. It has an open arched roof, is 25 ft. in height at the apex, and 15 ft. at the wall-plate, and is lighted on both sides by traceried windows filled with cathedral glass. The necessary domestic offices are situated at the north end, and the food will be brought up from the kitchen by means of a lift. At the extreme north-east corner of the building, facing the front, is situated the master's common-room, and in the rear are the domestic offices, which are entered by a door on the east side approached by a flight of steps leading from Victoria-road. Over the class-rooms are ranged on the first-floor nineteen studies for boys, 12 ft. by 7 ft. 9 in., and 8 ft. 6 in. high. Each study is ventilated into the long passage, which in turn is ventilated at both ends. On the same floor, at the north-east angle of the building, are situated two masters' sitting-rooms, one master's bedroom, and the matron's sitting-room. The approach to the boys' studies is by a flight of stairs leading from one end of the long passage on the ground-floor. This staircase is carried to the other apartments above, where the large dormitory is situated. The dormitory is 120 ft. by 20 ft. 6 in., and 15 ft. in height. At present it is fitted up with forty-two beds. It is ventilated by Sheringham's ventilator. In the turret portion of the edifice, at the north-east end, are placed the master's bed and sitting rooms, three bath-rooms, and a linen-room. On the third-floor of the higher part of the building are the matron's bedroom and a sick-room. The servants' rooms are in the attics, and over and above are water-tanks containing 1,000 gallons for use in case of fire. The class-room, boys' studies, dormitory, and dining-hall are heated by hot water, and the private rooms have open fireplaces. The heating-apparatus has been furnished by Messrs. Edwards & Son, of Marlborough-street, London, and Mr. Hunter, of Bristol, has done the plumbing. Mr. J. H. Newton has acted throughout as clerk of the works, and Mr. C. Hampton as foreman, and the building has been thus far completed without an accident.

Wolverhampton.—The trustees of the old Wolverhampton Blue-coat School have purchased a piece of land for the erection of new buildings, the Corporation requiring the old school buildings for improvements under the Artisans' Dwellings Act. Designs for the new buildings have been prepared by Mr. T. H. Fleeming, architect, Wolverhampton. The buildings consist of a centre block with two wings, in the form of the letter H. The main entrance to the building is in the centre block, whilst the wings on each side are for the respective accommodation of the children, schoolroom, master and mistress's department, storeroom, &c. The south wing contains on the ground-floor a schoolroom and classroom accommodating eighty children; and on the first floor, boys' dormitory for twelve inmates, lavatory, and storeroom. The north wing contains on the ground-floor the master's private rooms, and beyond these is the general kitchen department, over which is placed the girls' dormitory for ten inmates, with lavatory accommodation similar to that provided for the boys. In the centre block on the ground-floor are the dining-hall and dayrooms for the children, and immediately adjoining these are separate lavatories and cloakroom for the day scholars; also separate staircases to the boys' and girls' dormitories. The buildings, the elevations of which are of a simple character, will be erected in red brick, with moulded brick bands and strings, and the roof covered with brindled tiles. The work is being carried out by Mr. Lovatt, at a cost of about 3,500*l.*

Lewisham.—The memorial stone of the new Sunday Schools in connexion with and adjoining the Lewisham Congregational Church has been laid. There will be accommodation for about 500 children, with numerous class-rooms around the central space, also large room with gallery for infants. The opportunity is being taken to add a new and more commodious vestry for the use of the deacons. Mr. George Sherrin, of Broad-street-buildings, is the architect, and the work is being carried by Messrs. Staines & Son, of Great Eastern-street.

SCHOOL-BOARD SCHOOLS.

Buckingham.—The new buildings erected by the School Board in Well-street will accommodate 300 children, in two departments, arranged in a T form, viz., a schoolroom, 44 ft. long, fitted up with galleries and desks for 120 infants, and another for 140 boys and girls, 67 ft. long, with a class-room for forty children 20 ft. long attached, and both fitted with dual desks. All the rooms are of the same width (22 ft.) and height (14 ft. up to plate, and 28 ft. to ridge), the roofs being of open timber description, with arched principals and plastering between the rafters. The walls are formed of hollow brickwork, and a course of gas-tar and slate has been put throughout them at the level of the ground. The red brickwork has been relieved by white bricks of both a plain and ornamental character, as well as other red ones of a deeper tone, and blue Staffordshire ones for the more exposed surfaces, such as water-tables to chimney-stacks and buttresses. The roofs are covered with brown and blue Broseley tiles, and the ridges with Cooper's red ornamental crests. Each room is provided with a ventilating spirette, having rough plate-glass louvres, finished by one of Macfarlane's iron terminals, the one over the class-room being utilised for

the bell, provided by Mr. J. Barwell, of Birmingham. Elsley's patent ventilating-grates are adopted throughout. Separate porches, cloak-rooms, and lavatories, paved with Webb's (Worcester) encaustic tiles, are provided for each sex. The works have been carried out by Messrs. Marshall & Boyse, of Buckingham (the cost being 2,240*l.*), from the designs and under the superintendence of the architect, Mr. E. H. Lingen-Barker.

VARIORUM.

"THE Columnar Architecture of the Egyptians" is the general title of two essays by Waldo S. Pratt, of New York City, which have been reprinted from the "Proceedings of the American Academy of Arts and Sciences." The first of these is an examination of the well-known archæological question,—Was the Doric order imported into Greece from Egypt? in so far as that question is illumined by an investigation into the theoretic origin and development of the column and the pier as architectural members. The chronological, geographical, and politico-historical elements of the problem are for the time forgotten, and the attention fixed on the comparative artistic value and significance of the so-called "proto-Doric" pillars in Egypt and the columns of the Doric style in Greece, as capable of bearing important testimony to the actual connexion between the two. In the present state of our knowledge, this method of attacking the question Mr. Pratt thinks the only one that leads to even measurably certain conclusions. It is an able essay, and the writer says in conclusion, "If I have succeeded in showing by this rather extended piece of argumentation how the Greek and Egyptian forms in question may have arrived at the similarity that they exhibit from entirely different starting-points; how it is probable, both from the general tendencies of architecture in the two countries and from the divergences of the forms themselves, that this difference of origin is real; and how this conclusion renders it altogether probable that the Greek order is not an imitation or derivative of the Egyptian, I have attained my object." The second paper is "A Classification of Egyptian Columns."——The current number of the *Nineteenth Century* includes, under the title, "A Real 'Saviour of Society,'" by Sedley Taylor, an instructive account of the present position of the establishment founded by the Parisian house-decorator Leclaire, to a knowledge of which we were the first to introduce English readers many years ago. Its present condition appears to be very satisfactory.——The twenty-second edition of "Black's Picturesque Tourist in Scotland" (Black, Edinburgh), now before us, calls for the warmest commendation. It is very fully illustrated with well-drawn views, plans, and maps, and should be obtained by all who are about to cross the Border. It is so arranged that reference to any part required is very easy.——*House and Home* is now the organ of the Working Men's Club movement. Its design is to elevate, and its editor is making efforts to carry out this design.——Messrs. Dalziel, Brothers, have for many years been engaged on a series of Bible Illustrations from original drawings by some of our most eminent British artists. An India paper edition, of limited number, will be issued as "Dalziel's Bible Gallery," and will contain drawings by Sir Frederick Leighton, P.R.A., E. J. Poynter, R.A., G. F. Watts, R.A., E. Burne Jones, F. Madox Brown, Holman Hunt, and others. The volume will be issued early in November, by Messrs. George Routledge & Sons.

Miscellanea.

Chapel of St. Columba's College, Dublin. A few days ago the Archbishop of Dublin opened the new chapel, dedicated to St. Mark, at St. Columba's College, near Dublin, which has been erected at a cost of nearly 7,000*l.*, from designs by Mr. W. Butterfield. The trustees of the late Marshal Beresford's fund contributed the greater portion of the money. The chapel is 80 ft. in length, 28 ft. in width, and 40 ft. in height, and many of the fittings of the former chapel have been transferred to it. Rich marbles are used in the chancel, and several windows are filled with stained glass. The Earl of Erne, Mr. and Lady Mildred Beresford-Hope, Lady Helena Trench, and others, have given many of the ornaments.

The Electrical Railway.—Siemens's electrical railway is running constantly every day at the Brussels Exhibition, and earning a great deal of money. It runs under bridges, whisks round and over bridges at the speed of a fast trotting horse. The engine is no bigger than a tea-box, and the driver sits astride of it with the brake and contact lever in his hands. There are three carriages, each carrying six persons, seated back to back, after the manner of an Irish jaunting-car. The power being greatest when the current is let on and the coils of the locomotive are stationary, there is a sharp jerk on starting. In going uphill the driving current is also stronger than in going downhill, for the same reason, namely, that there is a greater difference between the velocity of the revolving coil in the stationary dynamo-electric machine, or generator, and that of the revolving coil in the moving machine or locomotive in the former case than in the latter. The electric railway is evidently quite a success, and we observe that an experimental line is being fitted up on the Camden and Amboy Railway in New Jersey, in order to test whether the system is applicable to the New York elevated railways.—*The Electrician.*

A New School of Art.—A building is about to be erected at Chiswick for use as a school of art, in connexion with the Science and Art Department, and under the direction Mr. E. S. Burchett, of the South Kensington Schools, and Mr. F. Hamilton Jackson, late of the Slade School. The president is his Grace the Duke of Devonshire, and the committee consists chiefly of artists and architects resident in the locality. The course of instruction will comprehend the following subjects:—Freehand in all its branches, practical geometry and perspective; architectural and mechanical drawing; painting,—in oil, tempera, and water-colours,—of ornament, flowers, objects of still-life, &c.; the figure from the antique and the life; and the study of anatomy as applicable to art. The new building will be situated in the Bath-road, Bedford Park, and will be in harmony with the adjoining church and stores, the style chosen being "Old English," in red brick and rough-cast plaster work. Mr. Maurice B. Adams is the architect.

Pluckington Bank, Liverpool.—Mr. Hamilton Fulton, engineer, who has had large experience in river improvements, has been appealed to to express his views respecting the removal of this serious obstruction to the Mersey navigation. His impression is that the proposed operation of sluicing would prove utterly abortive. He thinks the most effectual means of correcting the evil would be the erection of training walls of certain heights and lengths both on the eastern and western sides of the Mersey, and that this is a matter which ought to have been faced years ago, and that delay has been very pernicious.

The Tay Bridge Works.—For some time workmen have been engaged, under the direction of Mr. Barlow, C.E., in sinking an experimental cylinder at the west side of the Tay Bridge, for the purpose of ascertaining the nature of the strata of the bed of the river at a depth of from 20 ft. to 30 ft. Huge piles have been driven into the ground, and the staging was almost erected when, on Monday night, a south-westerly gale of great violence sprung up, and the whole of the staging was swept away, nothing being left save the bare piles. Fortunately, the workmen had ceased their labours before the gale began.

Leyland Local Board, Lancashire.—A general meeting of this Board was held on the 6th inst. for the purpose of considering the competitive schemes for the sewerage of the No. 1 District of Leyland. The schemes were four in number, and were submitted by Messrs. Addie & Sons, Preston,—estimated cost, 4,126*l.* 11s. 6d.; Messrs. Brierley & Holt, of Blackburn,—5,616*l.* 2s.; Mr. Charles Tomlison, of Rotherham,—3,750*l.*; and Mr. William Wrennall, of Castle-street, Liverpool,—5,000*l.* It was resolved to adopt the plans of Mr. Wm. Wrennall.

Fall of a Girder.—Last week a fatal accident occurred at the New Public Hall buildings, Perth. A large girder of 56 ft. span, and weighing 2½ tons, was being raised by means of a crane, and when nearly placed in its position on the tops of the walls, the ropes by which it was supported snapped, and it fell to the ground, a distance of 30 ft., taking with it a scaffold on which were several workmen. James Agen, jun., labourer, sustained severe internal injuries, from which he died in the infirmary.

TENDERS

For the erection of buildings at Cricklewood Farm, Edgware-road. Mr. Robert Hutchinson, architect:—

Gummow	£2,203 0 0
Cooke	2,155 0 0
Kearley	2,148 0 0
Rice	2,110 0 0
Angood	2,080 0 0
Van Camp	2,077 0 0
Beale	1,945 0 0
Donne	1,855 0 0
Parker	1,850 0 0
Newton	1,842 0 0
Gould & Brand	1,840 0 0
Blandford & Co.	1,829 0 0
Russell & Cowley	1,750 0 0
Willmott & Son	1,715 0 0
Bunting	1,640 0 0
Vaughan	1,588 0 0
Garrud	1,575 0 0
French	1,565 0 0
Wade	1,549 0 0

For the erection of a villa residence at "The Hyde," Hendon, Middlesex, for Mr. J. Hetherington. Mr. Robert Hutchinson, architect:—

Bird	£1,400 0 0
Kirby	1,345 0 0
Newton	1,269 0 0
Donne	1,244 0 0
Bunting	1,194 0 0

For alterations and additions to farm buildings, Bolnhurst, Beds. Mr. Robert Hutchinson, architect:—

Fisher	£530 0 0
Wade	380 0 0
Wildman	372 0 0
Francis	365 0 0
Mason	342 0 0

For making-up roads at Wanstead, Essex, for the Wanstead Local Board of Health. Mr. John T. Bressey, surveyor:—

	A.	B.	C.
Lawrence & Co.	£1,294	£104	£2,880
Cardus	856	69	1,629
Hawson	705	105	1,480
Porter	682	60	1,274
Bell	553	48	1,324
Pizzey	619	60	1,226
Jackson	550	90	1,100
Taylor	407	37	1,143
Impey*	330	46	1,159
Peile & Sons†	401	50	810

* Accepted for A and B. † Accepted for C.

For erecting three villa residences, River-street, Islington. Mr. Wm. Smith, architect. Amended estimates:—

Mattock Bros.	£2,170 0 0
Steel Bros.	2,140 0 0
Harper	1,953 0 0
Shurmur (accepted)	1,845 0 0

For foundations, &c., of new building at No. 1, Monument-yard. Mr. William Smith, architect:—

Crabb (accepted)	£960 10 0

For erecting stables, &c., Holloway-road, Islington. Mr. William Smith, architect:—

Combes & Son	£836 0 0
Mattock Bros.	666 0 0
Shurmur	666 0 0
Harper	650 0 0
Carke & Son	644 0 0
Dunford & Langham	594 0 0
Steel Bros.	591 19 0

For the erection of additional vagrant wards at the Chesterfield Union Workhouse. Messrs. Rollinson & Son, architects:—

Brown & Heath	£1,649 5 0
Shacklock	1,470 0 0
Stevenson	1,430 0 0
Cropper	1,355 0 0
Palfreyman	1,297 0 0
Wright	1,270 0 0
Gough	1,259 0 0
Glossop	1,250 0 0
G. & T. Margerrison, Barlow, near Chesterfield (accepted)	1,216 19 5
Brown	1,140 0 0
Knowles (withdrawn)	972 0 0

For warehouse, Little Queen-street, Holborn. Quantities supplied by Messrs. Williams & Gritten. Mr. Lewis Solomon, architect:—

Carter & Son	£2,599 0 0
Kirk & Randall	2,558 0 0
Mark	2,419 0 0
Larter & Son	2,355 0 0
Conder	2,292 0 0
Palmer	2,223 0 0
Patman & Fotheringham	2,195 0 0
Downs (accepted)	2,035 0 0

For alterations Gloucester-place, Portman-square. Mr. Lewis Solomon, architect:—

Vernall & Griffiths	£1,719 0 0
Vears	1,549 10 0
Davey	1,530 0 0
Canning & Mullins	1,509 0 0
Downs (accepted)	1,378 0 0

For shops and offices to be erected upon the site of No. 42, Old Broad-street, for Mr. E. J. Cave. Mr. E. G. Wyatt, architect:—

Wrought and Cast Iron Work, including Fixing, &c.

McLaren & Co.	£1,100 0 0
Measures Bros.	1,076 0 0
Dawnay	1,075 0 0
Gardner & Co. (accepted)	937 15 0
Stanley, Hall, & Co. (too late).	

Portland, Bath, and Dumfries Stoneworks, including Carving.

Tildesley	£2,493 19 0
Lear	2,369 0 8
Outhwaite	2,156 15 0
Seale (accepted)	2,104 12 0

For the erection and completion of the new asylum for the borough of Kingston-upon-Hull. Messrs. Smith & Brodrick, architects:—

Barry, Scarborough	£58,523	14	1
Lovett, Wolverhampton	58,000	0	0
Ives & Son, Shipley	55,878	0	0
Howell & Son, Bristol	55,200	0	0
Brier, Sons, & Wilson, Dewsbury	55,200	0	0
Hughes & Stirling, Bootle	55,000	0	0
Musgrave, jun., Hull	54,200	0	0
Simpson & Malone, Hull	53,516	14	5
Horseman, Wolverhampton	53,500	0	0
Dennison & Son, York	52,900	0	0
Sergeant & Son, Hull	52,340	0	0
Garlick, Birmingham	51,899	0	0
Vidler, Chesterfield	50,951	0	0
Wilson & Son, Headingley	50,829	0	0
Riggal & Hewins, Grimsby	49,995	0	0
Hockney & Liggins, Hull	49,904	0	0
Holdsworth, Bradford	49,869	0	0
Wilson Bros., Hull	49,800	0	0
Jackson & Son, Hull (accepted)	43,652	10	0

The tenders of Messrs. Haden & Son, Trowbridge, for general engineering; Porter & Co., Lincoln, for gas-works; Bradford & Co., Manchester, for laundry fittings; and other minor contracts, being the lowest, were also accepted, amounting in all to the sum of 6,064*l.* 4s. 6d., making the total cost 49,716*l.* 14s. 6d.

For new Free Library, Science and Art Schools, and Museum, Cardiff. Messrs. James, Seward, & Thomas, architects:—

Lissaman, Leamington	£10,193	0	0
Stephens & Bastow, Bristol	9,699	0	0
Bowers, Hereford	9,500	0	0
Furnell & Fry, Cardiff	9,380	0	0
Brock & Bruce, Bristol	9,280	0	0
Webb & Co., Cardiff	9,140	0	0
Elliott, Cardiff (too late)	8,960	0	0
Shepton, Cardiff	8,750	0	0
Howell & Son, Bristol	8,695	0	0
Miles, Newport, Monmouthshire	8,595	0	0
Davies Cousins, Cardiff	8,550	0	0
Lock, Cardiff	8,540	0	0
Roberts, Cardiff (accepted)	7,984	0	0

For alterations to the town-hall buildings, Bilston. Messrs. Bidlake & Fleeming, architects:—

Bradney & Co.	£3,735	0	0
Higham Bros.	3,550	0	0
Sansom	3,540	0	0
Lovatt	3,500	0	0
Hunter	3,499	0	0
Jones & Sons	3,295	0	0
Ford	3,275	0	0
Nevett Bros.	3,190	0	0
Bedford	3,125	0	0
Nelson (accepted)	2,996	0	0
Trow	2,960	0	0

For manufactory, Camden-town, for the Anglo-Russian Iron and Tin Plate Company. Mr. Francis Butler, architect. Quantities by Mr. Leaning:—

Lathey Bros.	£16,100	0	0
Stephenson	14,780	0	0
Chappell	14,375	0	0
Patrick & Sons	14,158	0	0
Roberts	13,936	0	0
Shepherd	13,653	0	0
Nightingale	13,081	0	0
Tarrant & Son	12,863	0	0

For the erection of a school chapel, Leytonstone. Mr. J. Randall-Vining, architect:—

Bangs & Co., Stratford	£1,098	0	0
Boyce, Bow	1,093	0	0
Gentry, Stratford	995	0	0
Mansfield, Stratford (accepted)	978	5	0

For cleaning and painting works to interior of Wesleyan Chapel, Quex-road, Kilburn, for the Committee:—

Wright	£226	10	0
Pitman & Son	177	1	0
Hawtin (accepted)	133	0	0

For additions to St. Bartholomew's Parsonage, Sydenham. Mr. Cutts, architect. Quantities supplied:—

Bowyer	£825	0	0
Lathey Bros. (accepted)	820	0	0

For cleaning, painting, and paperhanging works at "Exford," Losts-road, Clapham, for Mr. E. Price. Mr. W. Newton Dunn, architect:—
Pitman & Son, accepted.

For the erection of stables, Farm-street, Berkeley-square. Mr. F. W. Hunt, architect:—
Downs & Co. accepted.

For proposed enlargement of the Clarkson-street Schools, for the West Ham School Board, to accommodate 309 children. Mr. J. T. Newman, architect. Quantities supplied by Messrs. Curtis & Sons:—

Catley	£2,450	0	0
Hosking	2,197	0	0
Boyce	2,165	0	0
Morter	2,073	0	0
Abrahams	2,064	0	0
North Bros.	1,998	0	0
Reed	1,997	0	0
Hearle & Son	1,953	0	0
Nightingale	1,921	0	0
Gentry (accepted)	1,890	0	0

For repairs and re-decoration of the King's Weigh-house Chapel, Fish-street-hill. Mr. J. E. Saunders, architect:—

Sabey & Son	£750	0	0!
Dove Bros.	595	0	0
Colls & Sons	495	0	0
Greenwood	409	0	0
Staines & Son	384	0	0!

For additions to No. 28, Avenue-road, Regent's Park. Mr. E. Hoole, architect. No quantities:—

Dove Bros.	£3,295	0	0
Williams & Son	3,065	0	0
Bywaters	2,853	0	0
Lathey Bros. (accepted)	2,834	0	0

For building three houses and stable at Tulse-hill, for Mr. Stevenson. Mr. C. W. Lovett, architect:—
Fisher Bros. (accepted) £1,530 0 0

For building a villa residence at Esher, for Messrs. Wells & Lemottee. Mr. C. W. Lovett, architect:—
Fisher Bros. (accepted) £490 0 0

For building a villa residence, Bellenden-road, Peckham. Mr. C. W. Lovett, architect:—
Batstone (accepted) £350 0 0

TO CORRESPONDENTS.

Norwich and the Architectural Association.—We shall let our readers hear something more on this head next week.

M. I. B. A (many thanks for kind expressions; letter would be out of place in the *Builder*).—E. G. W. (first list did not reach us).—W. S.—H. & J.—A M.—A. J. B.—A G. & Co.—Mr. G.—W. R. D.—J R. V.—C. & Sons.—P. & Son.—C. F.—W. B. D.—T. C.—J. L.—W. & D.—S. R & Son.—A. B.—G. C.—W. H.—R. H.—W. W.—L. S.—D. Bros.—S. & B.—W. C. B.—T. N.—H. S.—S. N.—H. W.—S. & Sons.—L. Bros.—A. B. (received).—R. M. B. (next week).

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